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SEPTEMBER 1983 VOLUME 2, NUMBER 6

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- Video Games at Harvard
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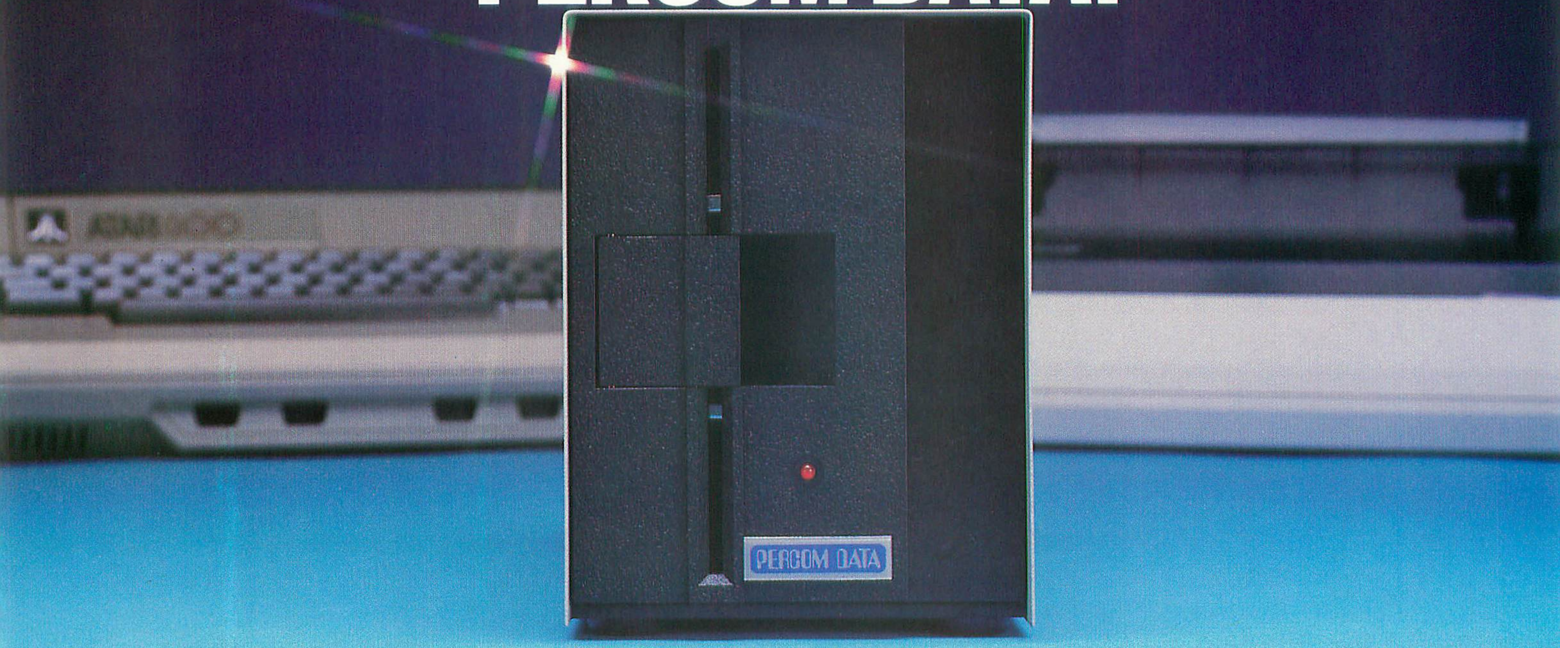
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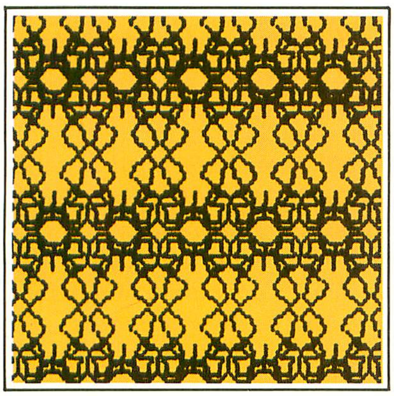
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I/O BOARD

MISSING LISTINGS

Imagine my surprise, as I was reading Jerry White's article, "Conserve Ram", only to discover the promised listing was not there! So, everyone makes mistakes . . . I then anxiously turned to Ed Stewart's "Talk is Cheap" and got very enthused about making my ATARI talk. But once again, I found the program referred to in the article was not there! Is it possible to get copies of these listings?

David Shult
Portland, OR

Missing listings appeared in HELP! (August 1983 ANTIC). We regret the errors. —ANTIC ED

YOUNG ENTHUSIAST

I am eleven years old and am very interested in the ATARI computer. I have designed my own program which helps kids do arithmetic. Please send me literature on the ATARI computer and Player/Missile graphics.

Glenn Helsby
Queensland, Australia

Glad to see ANTIC in use so far away. The only literature we are able to send is our magazine, but we hope our P/M article this time helps meet your need.
—ANTIC ED

1200XL UPDATE

It is nice to learn that Atari is thinking ahead. Perhaps they, and magazines such as yours, can update 1200XL owners first. As a full-priced owner (before April 11), I am still waiting to use it, as many 800 programs fail and full-priced local stores cannot help. Any response?

H.E. Cornell
Colorado Springs, CO

Owners of the 1200XL are still in the swim. Software compatibility problems are software-based (though extensive). The 1200 should have no problem with new, properly-vectored programs.
—ANTIC ED

TIMELY TOUR

"Anatomy of an ATARI" (ANTIC, April 1983) was timed perfectly for me; I needed to investigate I/O failure of my 410. Following Mr. Herring's instructions I found cracked solder at the peripheral port pins. After resoldering, I completed the guided tour of my 800, reassembled the pieces and tried the cassette unit. It worked again, as usual (which was never very good). Undaunted, I replaced the peripheral-port plug on the 410's cable. Now the recorder works fine—better than new!

Does anyone know how I can hook up my sons's TI "Speak and Spell" to the ATARI joystick ports so I can control its voice synthesizer?

Bradley Tompkins
Lorton, VA

DISK QUIZ

I recently noticed an ad for a Rana Systems 1000 Disk Drive. Please tell me the advantages and disadvantages of this machine.

Incidentally, what is the difference between single and double density? Does the Atari 810 support double density?

Jeff Riegel
Santa Clara, CA

Single density, for ATARI, means that each of the 720 sectors on the disk contains 128 bytes of data. With double density, each sector holds 256 bytes within the same area. Note that the new Atari DOS 3.0, which will be used in the new 1050 disk drive and the 1450XLD, increases the number of sectors per disk to 1023, but each sector still holds only 128 bytes. Thus, DOS 3.0 is really only one-and-a-half density.

The 810 as manufactured by Atari does not support double-density operation. There is a new product called the Turbo 810 that will convert the 810 to double-density operation. Watch for a review in ANTIC. We also intend to publish a review of the new Rana drives.
—ANTIC ED

continued on page 9

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COMPLIMENTARY

I would like to commend you on ANTIC and thank you for mailing it with a slip cover. The games are excellent and the user columns are very informative. As far as I am concerned, ANTIC is the only publication that an ATARI user would ever need. I also like ATARI's parts department and its toll free number. My ANTIC chip died, but one phone call and three days later my 800 was back on line.

C.A. Dyson
Pacific Grove, CA

We appreciate your compliment (we do get a few, but haven't printed many). We are all ATARI users too, including the boss, so we think we have a good perspective on our reader's needs. The Atari service numbers are (800) 538-8543 (U.S. except Calif.) and (800) 672-1404 (Calif. only). —ANTIC ED

MIRROR IMAGE

There is nowhere I can learn ATARI BASIC, so I started to teach myself. I used the book, "Your Atari Computer." It helped me and so did ANTIC magazine. I have made a lot of hi-resolution graphics and I have written a program which prints anything backwards. Here it is:

```
10 GRAPHICS 0:POKE 752,1:OPE
N #1,4,0,"K:"
15 SETCOLOR 2,1,0
20 DIM NAME$(38)
30 ? "TYPE IN YOUR NAME";:INP
UT NAME$
40 LENGTH=LEN(NAME$)
50 FOR Q=LENGTH TO 1 STEP -1
60 R=R+1:POSITION R,5:? NAME
$(Q,Q)
70 NEXT Q
80 ? :? :? "AGAIN [Y]ES/[N]O";:GE
T #1,B
90 IF B=ASC("Y") THEN RUN
100 IF B=ASC("N") THEN POKE 7
52,0:END
110 GOTO 90
```

Masahiro Mori
Taichung, Taiwan

DISK DRIVE DOUBTS

I just bought Atari 810 disk drive, and wonder if I should have gotten one of the other new drives now available for the ATARI.

Can game disks made for the 810 work in a double-density drive?

Nick Castellano
Wantagh, NY

The 810 disk drive was designed for the ATARI computers and is a good, reliable piece of equipment. Drives by other vendors may offer added features and sometimes lower price. Newly released products, however, often have unanticipated problems. For hobby computing, we think your choice was okay. Most double-density drives for the ATARI will read single-density disks as well. —ANTIC ED

EXIT FIXER

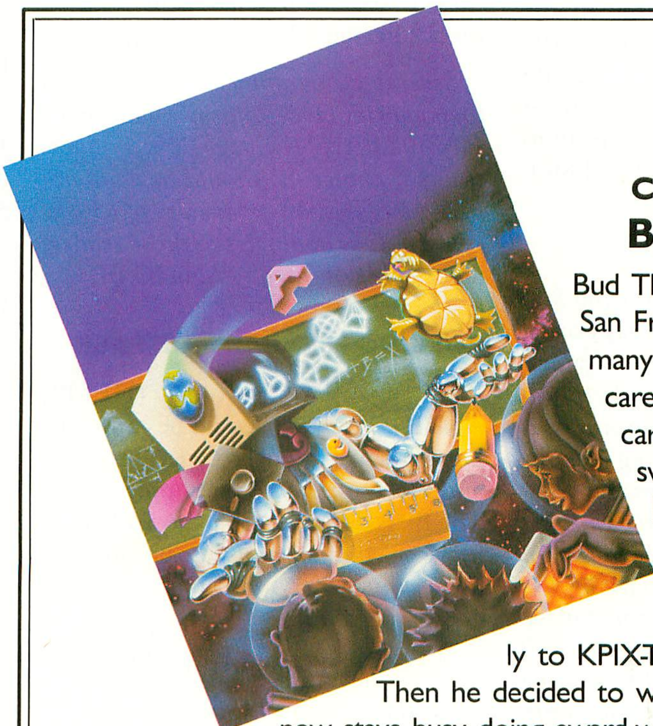
I think your magazine is terrific. It is informative and helpful to beginners and "pros" alike.

My brother and I were playing 3-D Maze from ANTIC, April 1983, and were having trouble discerning the exit from other hallways. Adding these two lines was a great help:

```
431 IF X<XM OR
X>=XM+MD-1 OR Y<=YM OR
Y>=YM+MD-1 THEN
A$(Y*40+X,Y*40+X)=CHR$(4):
GOTO 434
871 IF A$(A+D,A+D)=CHR$(4)
THEN RETURN
```

Keep up the good work!

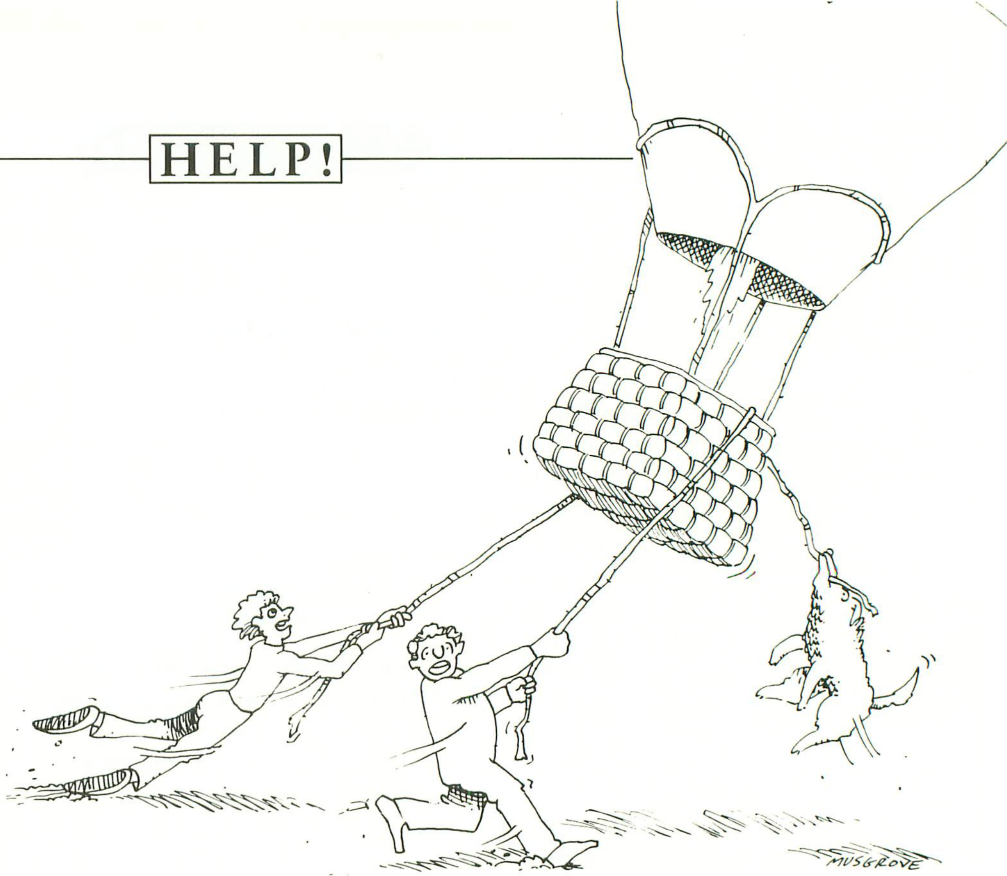
John S. Kobe
Laurel, MD



COVER ARTIST
BUD THON

Bud Thon, a resident of the San Francisco area for many years, started his art career painting flames on cars and airbrushing sweatshirts. This led him to ad agencies, design studios, corporate art departments and eventually to KPIX-TV as art director. Then he decided to work for himself, and now stays busy doing award-winning illustrations for such clients as Atari, Activision, Levi's, RCA, LucasFilms, and now . . . ANTIC!

HELP!



LIST ASSISTER

There is a slight problem with the program List Assister (page 93, July 1983 ANTIC). As written, the program cannot handle a program line containing only three characters (not including the line number) that is not a REM statement (e.g. X = 2). To remedy this, delete the space after REM in line 60, as

```
R$ = "REM"
```

Also, change line 200 to read:

```
200 IF A$ (N + 1, N + 3)<>R$
  THEN RF = 1
```

Also, change the word OR in line 665 to AND to allow the program to properly read the INPUT filename.

PANIC

In your article in the July ANTIC describing the new Atari XL line, you state that "the old ATARI 400 and 800 computers will be discontinued. . ." Help! I am the avid owner of an ATARI 800 and would appreciate it if you could inform those of us who are panicking of what this discontinuation will mean to the future of the ATARI 400 and 800.

Erik Macki
Midland, MI

Don't panic. the ATARI 400 and 800 should continue to be well-supported and useful machines for many years. Atari is committed in principle to upward compatibility, which means that programs now legally working on your machine will work on new machines—probably until fundamental design changes require a radically different machine. Downward compatibility is another matter—new programs for the XL line may not work on your 800 because of new features in the Operating System. Therefore, make sure to verify compatibility before purchase. Most vendors will want to maintain downward compatibility in order to sell their products to the million or so owners of 400s and 800s. —ANTIC ED

SMALL STUFF

There is a programming error in Stunt Clown (ANTIC, July 1983, p. 69) that causes the picture to bounce up and down when the program is run on a 16K cassette system. To remedy this, change the 29 in line 990 to a 28.

Several typographical errors found their way into the Computer Quiz in the July 1983 ANTIC, page 120. In question #5, choice (d) should be zero, not one. Also, the correct answer to #5 was e, not d. Our apologies to those readers who were confused. —ANTIC ED

ROLLING HUMBAR'S DISEASE

Jeff Danley's problem (HELP!, ANTIC, July 1983) could be caused by breakdown of the mylar capacitors C203 and C206 on the power supply board. The fix is described on page 5-19 of the Service Manual, and can be done by owner, or by Service Center.

Robert A. Carr
Grand Forks AFB, ND

Could be, or possibly it is failure of another capacitor, any of which threaten further damage to power supply. First try RF switchbox substitution. If this fails, Service Center diagnosis and repair is advised. —ANTIC ED

MYOTIS NUMBER

An incorrect telephone number was given in the review of the Myotis Robot Arm (p. 110, ANTIC, July 1983). The correct number for Myotis Systems is (602) 747-9509.

DRAGONSMOKE

There is an error in Dragonsmoke in July 1983 ANTIC. In the program in the upper right hand corner of page 45, line 520 should read:

```
520 U = X - 10*T
```

NO EASMD

Your review of our product **BASIC A+** states erroneously that it "comes with EASMD at no extra cost." This is not true. BASIC A+ and OS/A+ are both included, however.

Bill Wilkinson
Optimized Systems
Software
Cupertino, CA

Bill further states that OSS has a new product, BASIC-XL, in cartridge form, that is compatible with, but more powerful than ATARI BASIC. —ANTIC ED

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ATARI INSTITUTE

Grants support educational projects

by GARY YOST

It's no secret that the microcomputer is reshaping the classroom environment. Traditional classroom structure is now only one of many options available to our society. Atari, Inc. has become a leading proponent for change in the educational arena, and the Atari Institute for Educational Action Research is its instrument.

What is the Atari Institute for Educational Action Research? Since Atari introduced its first computer products, the company has supported projects that use computers in education. In June, 1981, the Institute was formally chartered to provide equipment, advice and financial support to non-profit educational organizations. In its first two years, the Institute has given grants valued at over $1 million of ATARI Home Computer products and cash stipends to projects which improve education and promote lifelong learning.

Ted M. Kahn, Ph.D., has been the Executive Director of the Institute since its inception. He holds a B.A. in computer science and a masters degree and doctorate in psychology from the University of California at Berkeley. In addition, the Institute has a full-time staff, both at its headquarters in Sunnyvale and in New York. The 12 members of the Institute's Board of Advisors are in the vanguard of education, media and applications for microcomputers.

Distinguished persons actively involved in setting the Institute's course include: Marian Wright Edelman, attorney and president of the Children's Defense Fund; Roger Faxon, vice-president and chief operating officer, Lucasfilm, Ltd.; W. Tim Gallwey, author, educator and founder of Inner Game Corporation; and Herbert Kohl, well-known teacher, writer and educator.

According to Dr. Kahn, "the public, in associating computers with education, all too often assumes that education is equivalent to schooling. This is one of the reasons why schools are having major problems now, and is also one of the reasons why kids gravitate to much more informal learning situations. There is an intersection and a synergy between the two which is the key to the success of both. Students find that the constraints of the classroom don't allow them the freedom to explore the way they would really like to."

The first two projects undertaken by the Institute, a mobile van and a museum, focus on giving students "hands-on" experience with microcomputers. In Santa Clara, CA, the Industry Education Council - Atari Mobile Computer Van brings fifteen complete units to over 8000 students enrolled in 76 separate schools. Each unit is equipped with an ATARI computer, disk drive, printer and color monitor. A cooperative venture, this project is supported by cash grants from private industry, educators developing curriculum for all ages, and local government, all working together to achieve a common goal: bringing computer literacy to the entire community.

The Capital Children's Museum in Washington, DC, is a "learning-by-doing" museum open to children and their families. Atari granted equipment and cash for use in the museum's *Future Center* and Communications Exhibit. In the *Future Center*, visitors experience the classroom of the future. Over 100 members of the U.S. Congress were given a computer literacy course by the museum's staff. The recently released Atari graphics program, PAINT, was developed through the efforts of many people at the Museum. The Communications Exhibit draws children and adults from all backgrounds into a learning situation that dissolves the barriers of language, age and economic status.

There are Atari grantees in over a dozen states, ranging from Ivy League Universities to prisons, and from poverty-level community projects to handicapped individuals. Project TEME (Totally Enclosed Modular Environment), located at the Community College in Greenfield, Massachusetts, is a

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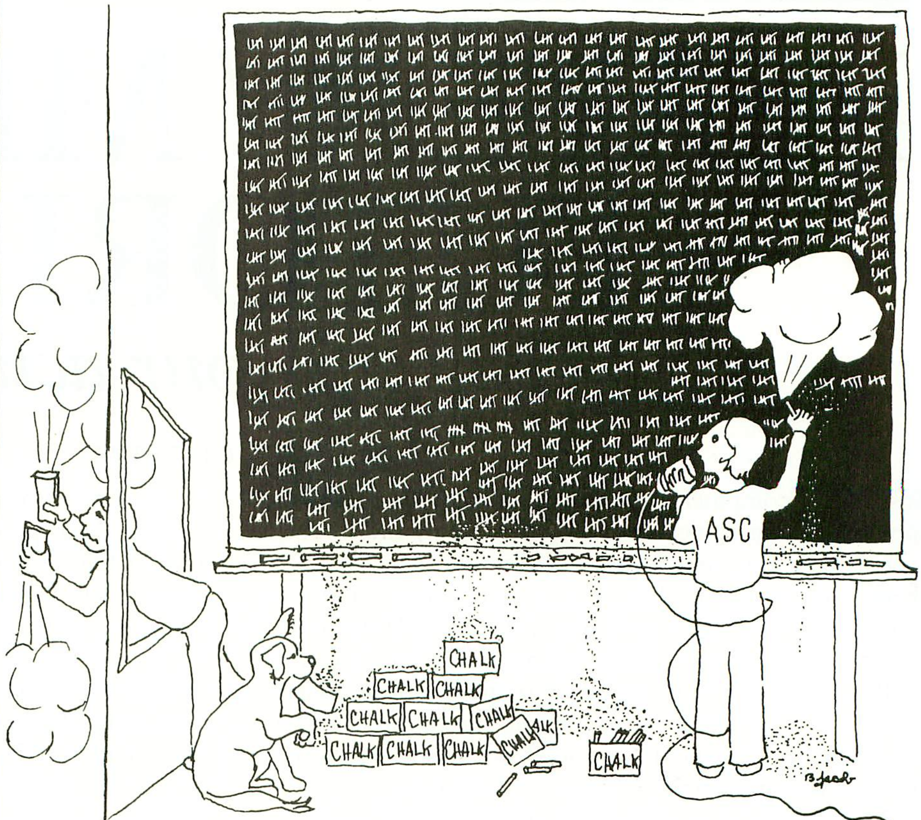
Gary Yost is a grantee of the Atari Institute, and consults with Advantek, a computer-graphics firm based in San Francisco.

unique program promoting the achievement of a balance between technological growth and preservation of the natural environment.

The lab at TEME is an accurate reproduction of the Space Shuttle-Orbitor, the end of each annual program being a full simulation of a space shuttle flight. TEME supervisors train student volunteers to serve as flight crew on board the shuttle and as ground personnel. The students experience the same things real astronauts do in space, enabling them to study the effects of a controlled environment on human behavior. The Atari Institute has provided the TEME staff with a travel grant this summer to finance participation in an international exhibition sponsored by the Pompidou Center in Paris, France. Part of their software was installed at the "Time and Space" exhibit there.

The Atari Institute not only supports non-traditional educational alternatives but is also pioneering computer applications in the schools. A good example of this is the Home-School Computer network project. This joint venture with the Picodyne Corporation and a high school in California allows parents to have access to school counseling, guidance, and grade score records at any time of the day, 365 days a year. In addition, the central computer is programmed to make an analysis at the end of each semester of the student's academic record for college entrance. Students, parents and teachers have an up-to-date report on the progress towards meeting college entrance requirements and can make their plans accordingly.

These projects are just a few of the dozens of valuable activities supported by the Atari Institute. Dr. Kahn has recently said, "The vision of the Atari Institute for Education Action Research is to demonstrate how the power of the smallest chips of silicon, when given to our most valuable resources — people — can unleash massive expansion of human potential, and give our generation and future generations the most valuable gift of all — the gift of lifelong learning."





PLAYER / MISSILE TUTORIAL

Step up your action

by CHRIS CHABRIS

Most ATARI computer owners have heard of Player/Missile graphics. P/M graphics are used in most of the popular machine-language arcade games like *Star Raiders, Jawbreaker,* and *Pac-Man*. They are also used in many utility programs such as Atari's *Program-Text Editor* and *Home Filing Manager*. Player/Missile graphics capability is built into every ATARI computer, and is unrelated to any language. Players and missiles may be moved around on the screen (which is known as the "playfield") without disturbing the screen display. They are simple to create and animate.

P/M graphics are controlled by two of ATARI's custom-designed chips: GTIA and ANTIC. CTIA, the older version of the GTIA chip, is identical for Player/Missile graphics purposes. These chips automatically handle P/M operation while a program is running, so a programmer does not have to write highly-detailed and complex screen-management code. Simple POKE statements in BASIC are all that are needed to control P/M graphics.

In order to understand P/M graphics, we must first define a few simple terms:

1. **Playfield Graphics:** The playfield consists of all the "normal" graphics; e.g., graphics produced in the various graphics modes using commands like PLOT, DRAWTO, and PRINT. Note that the term "playfield" has nothing to do with whether the program is a game or not. *VisiCalc* and *Shamus* both use playfield graphics.

2. **Hardware Registers:** These may be thought of as special memory addresses on the GTIA and ANTIC chips. Values are POKEd into these registers in the same manner as into normal memory, but each POKE usually has a specific and immediate effect (such as instantly changing the horizontal position of a player or missile).

3. **Memory Pages:** A page of memory consists of exactly 256 contiguous bytes of memory whose beginning address is evenly divisible by 256. Memory locations 1536 to 1791, for example, comprise Page Six because 1536/256 = 6.

Keeping these fundamental definitions in mind, we will experiment with a single player in this article.

Christopher Chabris recently graduated from high school, and works as a Junior Programmer for CSIBM, a computer service company in Yonkers, N.Y. He is a Chess Master candidate, and has represented the U.S. in international matches.

Depending upon the resolution you wish, a player is simply a list of 128 or 256 bytes of RAM. Each byte in the list consists of eight bits, and each bit corresponds to one pixel of the player. To help visualize this, think of a stripe, extending from the top to the bottom of the screen, made up of eight smaller stripes packed tightly together. If the player is 256 bytes long, the stripe consists of 256 horizontal lines, each line of eight small squares representing one byte of eight bits in memory. Figure 1 will help you see this image.

You can "turn on" any combination of the 256 × 8 = 2048 bits that represent the player by setting that bit to equal a "1". You can turn it off by setting that bit equal to "0". To do this, however, you must first give ANTIC information about how to display these bits on the screen. It is best to learn this in a step-by-step process. The process is outlined below and is illustrated with a sample program which displays player 0 in the center of the screen (the four players are numbered 0 through 3).

STEP 1 Select the size of your player.

Choose either single-line or double-line resolution. Single-line resolution gives players the height of a Graphics Mode 8 pixel (high resolution), while double-line corresponds to Graphics Mode 7 pixel size (lower resolution). Then choose the width of the player: "0" for the width of a GR.7 pixel; "1" for double that width; or "3" for quadruple that width. To make the sample program more understandable, we put the width value in a variable and remember the resolution for later use. The first line of the sample program sets the variable "WIDTH" to zero to make each player pixel equal one GR.7 pixel width:

```
1000 WIDTH=0
```

STEP 2 Reserve memory for your player.

The data representing the player images is stored in RAM. You must be certain that the area of memory chosen for this data will not be disturbed by anything else (such as your BASIC program, variables or strings, or playfield graphics). Therefore, you must lower the upper boundary of RAM so that BASIC and the Operating System (OS) will think that there

is less RAM than actually is available (the OS or BASIC cannot disturb this part of memory if it is beyond the upper boundary). You set this upper boundary by examining memory location 106, which always contains the number of pages of available memory, and changing it to a lower value. Subtract eight pages of memory for single-line resolution or four pages for double-line resolution. This saves enough memory for the maximum number of players and missiles, though we only use one player in the example program. After subtracting this block of memory from the upper boundary of available RAM, you must POKE the new value for the upper boundary back into memory location 106, as in the second line of the sample program:

```
1100 A=PEEK(106):A=A-4:POKE 106,A
```

STEP 3 Set up the playfield Graphics Mode.

Now that you have reserved memory space for your P/M graphics, you can execute the first GRAPHICS statement of the program with confidence that the screen will not interfere with our player. In the sample program, we use BASIC graphics Mode 0 which gives us 24 lines of 40 characters. We also turn off the cursor and clear the screen:

```
1200 GRAPHICS 0:POKE752,1:PRINT CHR$(125)
```

STEP 4 Set playfield and player colors.

Choose the background color and any other colors you wish to use. The sample program uses Graphics Mode 0 which allows only three colors (for the characters, the background, and the border). We set the playfield background color to black with a SETCOLOR command. Setting the color of a player is more difficult. Although each player can have its own independent color, the color cannot be set with a SETCOLOR command in BASIC. You must POKE the color value into memory locations 704 through 707 (colors for players 0-3 in that order). The value to POKE to these "color registers" is given by the formula:

COLOR = HUE*16 + LUMINANCE

where HUE ranges from 0 to 15 (the second parameter in the SETCOLOR statement) and luminance from 0 to 14 (even numbers only). Incidentally, instead of using the SETCOLOR command, you could also POKE colors into the playfield registers, addresses 708 through 712. For the sample program we chose HUE 3 (red-orange) and LUMINANCE 6, and the value to POKE is 3*16 + 6 or 54. The next two lines of our sample program set the color for both playfield and player:

```
1300 SETCOLOR 2,0,0
1400 POKE 704,54
```

STEP 5 Tell GTIA how wide to make your players.

This may be accomplished with a single POKE to locations 53256 through 53259 for players 0-3. You should become comfortable with the POKE statement, since it is necessary for every P/M operation when writing in BASIC:

```
1500 POKE 53256,WIDTH
```

STEP 6 Tell ANTIC where to find your players.

Hardware register 54279, called PMBASE, should be POKEd

continued on page 18

Figure 1. Player as stripe of memory on screen.

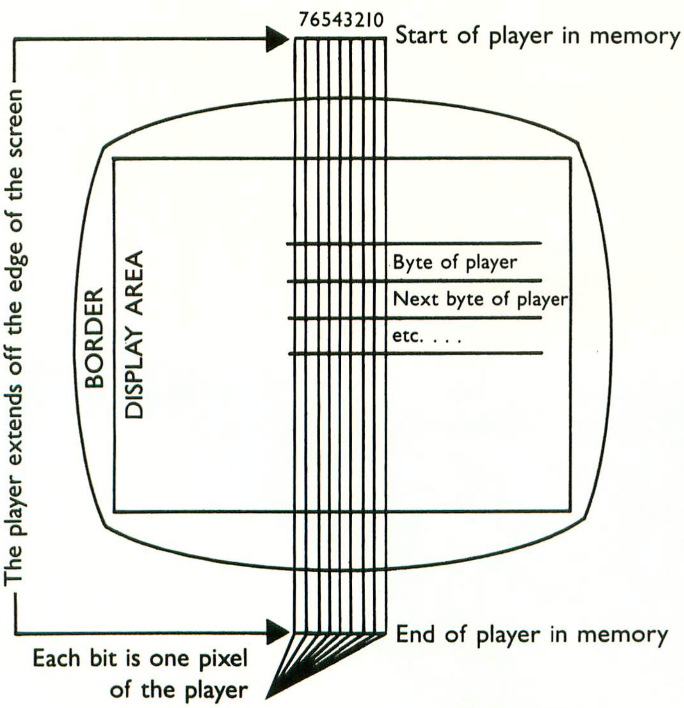
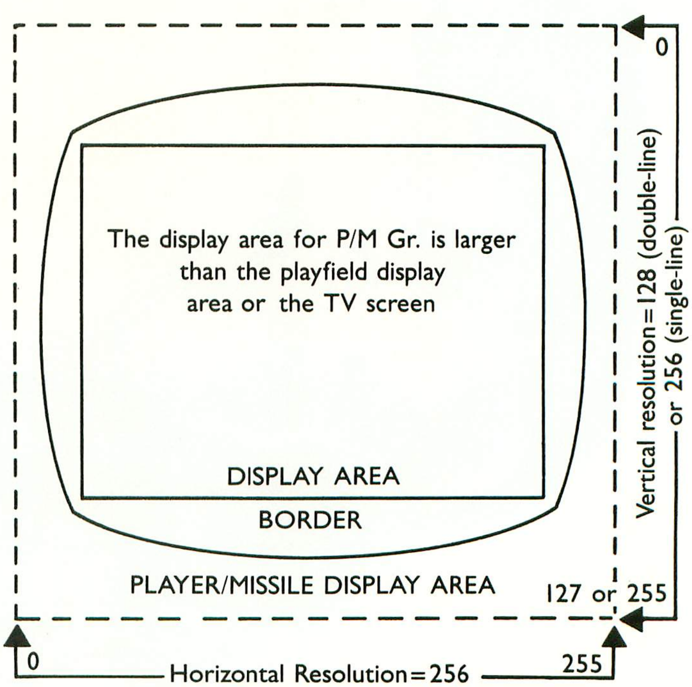


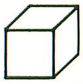
Figure 2. Horizontal and vertical coordinates of the player.



WE UNLEASH TH
POWERFUL GRAP



Figure 3. Draw the player on graph paper (a cube).



Our player

0	0	0	1	1	1	1	1
0	0	1	0	0	0	1	1
0	1	0	0	0	1	0	1
1	1	1	1	1	0	0	1
1	0	0	0	1	0	0	1
1	0	0	0	1	0	1	0
1	0	0	0	1	1	0	0
1	1	1	1	1	0	0	0

Figure 4. Calculation of byte values for the player.

Decimal value

128	64	32	16	8	4	2	1	
0	0	0	1	1	1	1	1	16+8+4+2+1=31
0	0	1	0	0	0	1	1	32+2+1=35
0	1	0	0	0	1	0	1	64+4+1=69
1	1	1	1	1	0	0	1	128+64+32+16+8+1=249
1	0	0	0	1	0	0	1	128+8+1=137
1	0	0	0	1	0	1	0	128+8+2=138
1	0	0	0	1	1	0	0	128+8+4=140
1	1	1	1	1	0	0	0	128+64+32+16+8=248
7	6	5	4	3	2	1	0	

Bit number

PLAYER/MISSILE TUTORIAL *continued from page 15*

with the page number of the start of the memory area reserved for P/M graphics. You must multiply that page number by 256 to find the actual starting address in RAM (remember that a page of memory is 256 bytes long). In the sample program we stored the value for PMBASE in the variable A. Now we tell ANTIC where to find the beginning of our reserved memory for P/M graphics:

```
1600 POKE 54279,A
1700 PMMEM = A*256
```

STEP 7 Determine the horizontal and vertical positions of your player.

The values for horizontal and vertical positioning of a player are independent of the current Graphics Mode. Horizontal positions may range from 0 to 255. Values of 0 to 46, however, will cause the player to "appear" off the left edge of the screen and it will not be seen. Similarly, values of 209 to 255 will put the player off the right side and it will not be seen. Vertical positions range from 0 to 127 for double-line resolution and from 0 to 255 for single-line resolution (this range is the number of bytes in the list that makes up the player). For single-line resolution, positions 0 to 31 and 224 to 255 are off the top and bottom of the screen. These numbers are halved for double-line resolution. Note that these "off-screen" values will vary slightly depending on the scanning adjustments of your television set or monitor.

The vertical position of a player is actually determined by the first byte in the player that is not zero (or blank on the screen). For example, if a player's vertical position were zero and every byte in its list were equal to 255 (all eight bits were "turned on"), the player would appear as a solid stripe of color extending from the top of the screen to the bottom. If the vertical position were eight, bytes 0-79 of the player would be equal to zero (all eight bits "turned off"). Figure 2 explains this. In our sample program, to indicate a position in the approximate center of the screen in double-line resolution, we set the variables P0X to 128 (half of 255) and P0Y to 64 (half of 127) to represent the horizontal and vertical coordinates of Player 0:

```
1800 P0X = 128:P0Y = 64
```

STEP 8 Clear memory garbage from your P/M graphics area.

This is accomplished with a FOR-NEXT loop. A zero must be stored in each of the 1024 bytes (four pages, as we determined in step 2) of the reserved P/M graphics area, so:

```
1900 FOR L = PMMEM TO PMMEM + 1023:POKE L,0:
     NEXT L
```

STEP 9 "Draw" your player on graph paper.

This step requires graph paper. Or you can draw a grid eight pixels wide and as many bytes high as you wish. Remembering that player is eight pixels wide, draw your player by making each bit that you wish to "turn on" equal to a number one. While you might want a long and narrow player, most are no more than 24 pixels high. For our sample program, we draw a player which is a small cube eight pixels high and eight pixels wide (see Figure 3).

STEP 10 Calculate the decimal values for each line in your player.

Having drawn your player, write the following numbers above each of the eight (there should be only eight!) columns of pixels of the player, starting from the left: 128,64,32,16,8,4,2,1. These numbers correspond to the binary value of bits seven through zero of a byte of memory. The value of each row or byte of the player is found by adding up the numbers above the columns whose boxes in that row contain a number one. See Figure 4 for an example using our cube.

STEP 11 Place the byte values for your player's shape into a DATA statement.

For the cube example, the DATA statement is:

```
2000 DATA 31,35,69,249,137,138,140,248
```

STEP 12 Place this DATA into the memory area for Player 0.

Table 1 lists the locations in the P/M graphics area which are reserved for each player. Find the proper resolution and go down the column until you find the number to add to PMMEM (see step 6) to obtain the starting address for a particular player's list of bytes. Add the vertical position of this player and you have the memory address to begin POKEing in the numbers in step eleven's DATA statement. In the sample program, a FOR-NEXT loop is used to POKE in this data:

```
2100 FOR J = PMMEM + 512 + P0Y TO PMMEM + 512 +
     P0Y + 7:READ BYTE:POKE J,BYTE:NEXT J
```

STEP 13 Tell ANTIC the resolution of your players.

POKE 46 into memory location 559 for double-line resolution or POKE a 62 into the same location for single-line resolution.

```
2200 POKE 559,46
```

STEP 14 Tell ANTIC to activate P/M graphics.

Everything is now ready to "enable" Player/Missile graphics on your computer. Do this by POKEing 53277 with the value 3 (always use a 3).

```
2300 POKE 53277,3
```

STEP 15 Putting your player's horizontal coordinates into the proper registers.

Without this last step, the players would be turned on but invisible because ANTIC could locate them at horizontal position 0 (off the left edge of the screen, as we saw in step 7). The horizontal position of the player is controlled by POKEing that coordinate into addresses 53248-53251 for players 0-3. The last lines needed in our program are:

```
2400 POKE 53248,P0X
9999 END
```

When you have entered all sixteen of these lines into your computer, type RUN and press [RETURN]. After a few seconds, you should see a small orange cube in the approximate center of a black screen, and the "READY" prompt in the upper left-hand corner. If this does not happen, check for typos. You should debug this program and have it working before going on because we will use it to illustrate the principles of P/M movement.

First, add a line to your program that will read a joystick plugged into Port One:

```
2500 J = STICK(0)
```

Consult pages 59-60 of your *BASIC Reference Manual* to find the values for the STICK function for horizontal and vertical manipulation of the joystick. They are:

14 for Up, 13 for Down, 11 for Left, and 7 for Right

As we determined in step 15 of the set-up procedure, player zero's initial horizontal position is controlled by POKEing a value into hardware register 53248. In fact, this may be done at any time during the program. Armed with this knowledge, we write the next two lines of the sample program:

```
2600 IF J = 7 THEN P0X = P0X + 1:POKE 53248,P0X
2700 IF J = 11 THEN P0X = P0X-1:POKE 53248,P0X
```

This fairly straightforward code determines if the stick is pushed right or left. Then it increments or decrements the variable P0X and POKEs the new value into player zero's horizontal position register (53248).

Vertical motion, however, is not as simple. There are no vertical position registers. To move player zero vertically, we must move the bytes that represent it through the reserved area of memory.

Remembering that each player in double-line resolution requires 128 bytes of the reserved P/M memory, look at Table 1 again. The memory for player zero begins at 512 bytes offset from PMMEM (1024 bytes in single-line resolution). We will use a FOR-NEXT loop to move only the bytes that contain data for that player forward one byte in memory. Since this routine is too large for one line, we use subroutines:

```
2800 IF J = 14 THEN GOSUB 3100
2900 If J = 13 THEN GOSUB 3200
3000 GOTO 2500
```

When the joystick is pushed up (the STICK function returns a value of 14), we want to move the player towards the top of the screen. This means moving it "backwards" in memory (recall that the 128 bytes for the player start with byte 0 off the top of the screen and end with byte 127 off the bottom). Likewise, we move the bytes "forward" in memory when the stick is pushed down (STICK(0) = 13).

First, the lines of code for the upward movement:

```
3100 FOR L = 0 TO 9
3110 POKE PMMEM + 511 + P0Y + L,PEEK(PMMEM +
     512 + P0Y + L)
3120 NEXT L
3130 P0Y = P0Y-1
3140 RETURN
```

We loop from 0 to 9 because our player is eight bytes long: 0 to 9 allows an extra byte on either side to be moved. If these bytes weren't included, the player would be copied backwards one byte, but the last byte would appear twice — in both the old and new locations. The zero at the end wipes out the old value for the last byte. Line 3110 does the work. There is only a difference of one byte between the address being PEEKed in the second part and the one into which its value is POKEd in the first part of the expression. The constant 512 is decremented to 511, so the address being POKEd is one lower than the one being PEEKed (the variables PMMEM, P0Y, and L remain constant throughout the line. When this is done ten times, the player has been moved backwards one byte in memory, resulting in a slight upward motion on the screen.

continued on page 104

ATARI IN THE CLASSROOM

Academic applications

SISTER SCHOOLS

A fourth grader in Iowa types a question into the computer. His eyes widen as he reads the reply — "NO I'VE NEVER SEEN A LOBSTER. BUT THERE ARE LOTS OF SHARKS!"

The Iowan is getting a firsthand account of the Pacific Ocean from a sixth grader in California. In the meantime, one of his classmates is receiving programming tips from a student in Massachusetts.

Another student is engrossed in a bilingual game of *States and Capitals*. She's playing in English and her partner in California is answering the questions in Spanish.

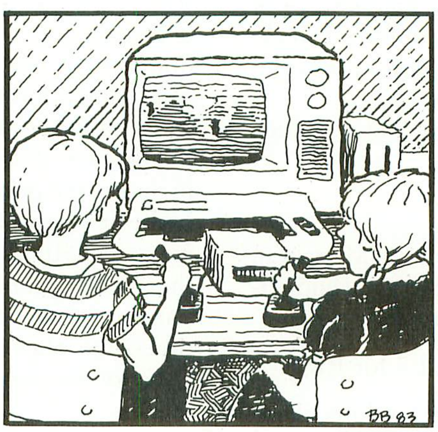
These students are in classrooms linked together by Atari Sister School Network, a telecommunications networking project founded by the Atari Institute for Educational Action Research.

Now in its second year, the Sister School Network consists of 10 elementary schools scattered across the United States. The mix includes Montessori, parochial, alternative and public schools. The Atari Institute selects the schools and equips each with two ATARI 800 systems and the necessary peripherals and software. Atari also pays for the long distance phone charges between schools.

"The first year was a learning experience for us," explained Sandra Williams, manager of program development at the Atari Institute. "We started on a small scale, matching up schools by designating them 'Big Sister' or 'Little Sister' based on the technological expertise of the classroom instructor. With the Big Sister the primary resource for the Little Sister, we set up a buddy system that makes the learning process much easier for first-time computer users and gives students a chance to see teachers in the learning mode."

The network uses BASIC, PILOT and LOGO programs. Students usually work two on a computer as there is no computer-assisted instruction (the Big Sister school is the resource when questions arise). Individual programs include Factory by Sunburst, Master Type by Lightning, Story Machine by Spinnaker and Teasers by Tobbs by APX.

The actual networking software used by the project was designed by George Amy, a teacher at Our Lady of the Rosary School in Union City, California. Amy wanted his students to see each other's input and output on screen at the same time. He took an existing program from the public domain, added a data file and adapted it for use in his classroom.



The network was using Amy's software when Atari learned of a new telecommunications capability under development at Picodyne Corporation in nearby Portola Valley.

A combination of hardware and software, the Picodyne Switch is based on a large microcomputer and allows for simultaneous use of five communication channels. Picodyne offered a prototype of the new product to Atari Institute.

"It was a wonderful opportunity for us," said Williams. "The switch really expanded our capabilities."

The Picodyne Switch features cross execution where two or more users can cooperatively execute the same program; one-to-one, real time for private conversations; conference real time; and bulletin board and mailbox options so users can leave messages for each other.

Making "electronic pen pals" is one way students use the networking system, according to Sara Armstrong, director of the Terra Nuova Montessori School in Hayward, California.

"We write the first chapter in my classroom," she explained. "And then students at the sister school add a chapter and send it to the next school, and so on.

"We communicated like this for several months and then at Christmas we visited a sister school and actually met the friends we'd made on the computer.

"It was really something," continued Armstrong. "Networking took away the isolated and impersonal machine aspect of the computer and made learning fun."

—Lee Miller

ONE ON ONE

When most people think about computers in education, they picture a third-grader learning multiplication tables or playing word games on the school microcomputer. Elementary and secondary schools across the country are exposing students to all aspects of computer use to prepare the children for the future. But who is training the older student — today's adult — who must use a database or word processing program in his everyday, workaday world right now?

John F. Kennedy University in Orinda, California is one school that is committed to teaching "computer literacy" to its students and staff. JFK offers mostly evening and weekend courses for adults who must work during the week but want to further their education.

Last September the Graduate School of Management received a grant of two ATARI 800's for the purpose of teaching computing to the non-traditional user.

"Most of our students never had any exposure to computers when they were growing up," said Shirley Daniels, instructor in the School of Management, "and certainly none of our faculty did."

In her business course this past spring, Daniels required her students to write their term reports (feasibility studies) on the ATARI using the Atari Word Processor.

Weekend workshops, open to the public, on the basics of computing had a large response. Business students involved in finance and accounting were also interested in learning programming on the ATARIs after class.

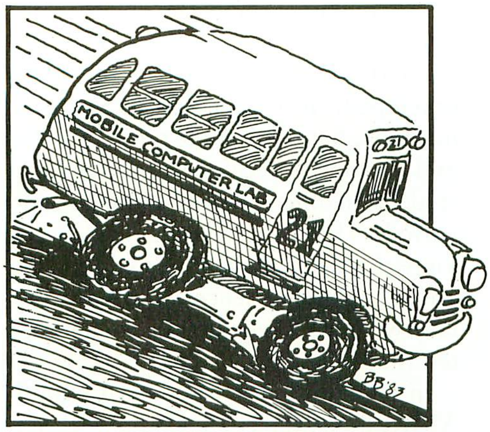
But the School's primary aim was to get the non-traditional user interested in computing. Late this spring Mike Apostolakakis, a graduate student in management with a strong programming background, began tutoring faculty and staff on the ATARI.

Mike spent four hours each with about 25 individual members of the faculty and administration all of whom had been reluctant to become involved with the group instruction. The first two hours were devoted to teaching the fundamentals of machine operation in the context of word processing. The second two hours were spent to exposing them to VisiCalc.

"Everybody liked this approach," said Mike. "Most people felt very good about it . . . in fact, they were very eager."

According to John Stanford, dean of the School of Management, JFK was "a good testing ground for the older student population." He believes that one-on-one instruction is the most effective way for anyone to learn computing, especially the busy adult.

—Deborah Burns



COMPUTER BUS

Last spring semester more than 3,000 school children throughout California's Napa Valley were treated to hands-on experience with ATARI computers. A refurbished school bus with 17 ATARIs on board circulated among the 21 public schools in the district, giving each fourth-, fifth- and sixth-grader several opportunities to work with Atari's PILOT language.

"This was one of the most successful projects I have seen in this district," said James Gibbany, administrator of curriculum services development in the Napa District. "It had a large impact on the community and the schools. The kids couldn't wait for the bus to come and they were highly motivated to learn."

Three introductory lessons were taught. In the first two lessons, students learned how to manipulate the keyboard and joystick by using a program that generated geometric shapes and various size letters. They also learned some rudiments of PILOT. At the third session, scheduled about two weeks after the first two lessons, each child typed in his or her own program. The program was also printed out on the one available printer.

The bus was furnished with 16 ATARI 400's and one ATARI 800 (for the instructor) by Far West Laboratories, an educational research institute in San Francisco that is keeping data on the project. An old school bus (circa 1953), provided by the district, was painted red, white and blue and named the Napa Valley Unified School District Computer Lab.

The lab accomodated 32 students at a time with each child sharing a 400. Each learning station also included an 11-inch Quasar television for video display and a cassette recorder for storage. The instructor's station (the 800) was equipped with a disk drive and dot-matrix printer as well as a TV and tape recorder.

The students' TV screens could be switched to display the instructor's "host" computer program for instruction and demonstration. Students could also reproduce the assigned lesson on their 400s and respond to the teacher's instructions.

To prepare the students for the introduction to PILOT, teachers in each of the schools provided classroom exercises without the use of the computer. The preview lesson consisted of learning about how the keyboard operates and a few programming terms. The lab sessions were 45-minutes each and occurred three times within two weeks.

—Deborah Burns

SOFTWARE START

Computers and kids seem to go together as naturally as peanut butter and jelly! Kids are enthusiastic about computers and all the games they can play on them. Learning is no longer a chore when they get to work on a computer.

In 1973 some foresighted administrators in Minnesota formed the Minnesota Educational Computing Consortium (MECC). The computers used then were large time-sharing systems, but nonetheless, over 400 school systems were using computers. Five years later MECC began producing microcomputing courseware for the Apple, which helped Apple gain popularity in school systems throughout the country.

Today the consortium developing quality educational software for the ATARI computers. In the current catalog, it has about 25-30 courseware packages available for the ATARI. These packages are usually multi-program packages that include several related pro-

continued on next page

grams and a support manual. For example, one of the popular packages, Expeditions, contains three simulations that are ideal for history or social studies.

The Elementary Biology package (reviewed in our Products Reviews department) contains Circulation, Odell Lake and Odell Woods. Here children discover the relationships in a food chain by role-playing.

Other packages available from MECC cover several subject areas including language arts, math, music, sicence, and social studies. There are a variety of programs available for children from preschool through grade 12.

Although some of the programs available for the ATARI were originally written for the APPLE computer, MECC would rather develop original programs for the ATARI computer. The majority of the programs are teachers written. MECC also sponsors contests during the year for new and original programs.

The MECC catalog with complete courseware description and price list is published twice a year. To obtain your catalog, call MECC at (612) 638-0627 or write: MECC, 2520 Broadway, St. Paul MN 55113.

—Linda Schreiber

MIAMI DOES IT

Over the last two years, students and teachers in Miami (Dade County), Florida and the county school board have made a real committment to computer education.

Computers, mostly ATARIs, can be found in all the elementary, junior high, and high schools. Computer literacy is stressed in every grade. In the elementary schools, students spend more time on drill and practice, while in the high schools, programming is the primary focus.

The Dade County School Board has purchased nearly 1,000 ATARI 800's. Individual schools have also obtained various computers on their own, bringing the total to about 1,300. These computers are spread throughout a county with an enrollment of over 256,000 students.

The Dade County School Board's involvement with computers has been a three-stage process. In 1981, a plan was developed for choosing a brand of computer and integrating it into the public schools. Based on price and performance, ATARI was the brand chosen.

Next, a curriculum guide was developed. It is not specific to any machine, but sets out the types of skills and learning activities with which students in different grades should be involved. The curriculum guide covers kindergarten through adult education. Based on the experiences gained over the last two years, the guide is being rewritten this summer.

In order to purchase nearly 1,000 ATARI 800s, the Dade County School Board applied for federal funds to supplement state funding. Under the federal grant, they were able to hire an education specialist who also serves as a librarian and programmer. That person runs a central lab where software can be collected and evaluated.

Educators who are interested in Dade County's computer education program can get more information by contacting Mrs. Marilyn Neff, Instructional Computing Coordinator, 1410 NE 2nd Avenue, Miami, Florida 33132.

—Richard Herring

COMPUTER MUSEUM

ATARI computers practically run the whole show at the Capital Children's Museum in Washington, D.C.! Many of the exhibits at the museum are controlled by either an ATARI 400 or 800. The computer displays are just a part of the large Communication Hall containing a working radio and television studio, a telephone network, and a real satellite. The past as well as the future are represented, from the most primitive of technologies to the most advanced. Children are encouraged to learn by touching and playing with everything they see.

A visitor's first introduction to the capabilities of the ATARI is through the Ice Age Cave. A sound and light show operated by an ATARI 400 demonstrates how our ancestors communicated back in the Ice Age by means of cave paintings, storytelling, and ancient rituals.

Another exhibit gives children the opportunity to watch an ATARI 400 outperform the room-sized 1950's Whirlwind computer. A videotape starring Edward R. Murrow and the Whirlwind is contrasted with a demonstration on the ATARI 400: the little ATARI runs exactly the same programs as the huge Whirlwind, but with greatly improved speed, sound, and graphics.

Five ATARI 800's at the Future Center are set up to display the voice, music, color, graphics, memory, and number-crunching power of the microcomputer. Games and programs illustrate the different ways microcomputers are used in communication: through simulation of an actual event, for example, or as a database, storing numerous items of information.

These displays give children a chance to really get to know an 800. When it's not reserved for classes and groups, visitors can use the 30 microcomputers in the Center to play games or write programs. Classes are offered for several different age groups: CompuTots, for ages three to seven, allows young children to learn about computers by playing educational games. CompuPlay provides an hour of directed exploration, while CompuBASIC teaches kids to write their own BASIC programs. CompuLab is for older children who have had a fair amount of experience and are interested in experimenting on their own.

Special events for groups can also be arranged: CompuGame turns the Future Center into a game arcade, and CompuParty lets children celebrate a birthday or special occasion. A visit to the Future Center is a favorite field trip for many classes from nearby schools, too.

Additional exhibits in the museum use ATARIs to demonstrate various educational concepts. Computers in the Think Metric Room teach children about measurement by enabling them to play Centimeter Eater. Players have to guess the metric length of a line before it is eaten by the Centimer Eater inch-worm. Children and adults alike enjoy creating bright, colorful pictures with Paint, a game that lets you select different shades from "paint cans," and then use a joystick to draw on the screen.

Other computers at the Capital Children's Museum include Wisecracker, a talking computer, the Kid-Net network of timesharing terminals. Children can send messages to different exhibits, or add their own name to a database of information about previous visitors to the museum.

—Julie Sickert



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VIDEO GAMES VISIT HARVARD YARD



by EDNA MITCHELL

If there is anything more surprising than "experts" formally discussing video games at Harvard, it must be their conclusion — they liked them! So enthusiastic were the reports that some in the press imputed an uncritical bias to the conference.

The participants also were probably surprised to find one after another of their colleagues reporting optimistically on the current and prospective effects of video games on both children and adults in our society.

Edna Mitchell is a professor and head of the Department of Education at Mills College, Oakland, CA. She was one of the researchers presenting reports to the conference.

I attended the "Harvard Conference on Video Games and Human Development" to report on my research with families in homes where video games are played (more about that below). First I should describe what this conference was all about.

Late last May, a group of social scientists, educators, medical specialists, and computer industry representatives gathered at the Harvard Graduate School of Education to discuss current and future research on the impact and use of video games.

The experts reported on their research, presented new kinds of games and software, and discussed their concerns about the uses of this new technology. All the participants tended to share a common enthusiasm and optimism for video games.

Although notes of caution and reservation were sounded at almost every presentation, the positive results from each study provided an underlying endorsement of video games and computer technology. Researchers and presenters found among themselves an unexpected support network, and many scientists who may have felt isolated in their enthusiasm for this technology (believing public opinion to be generally hostile to favorable reports about video games and computer learning) found a receptive and knowledgeable audience among their peers.

continued on page 26

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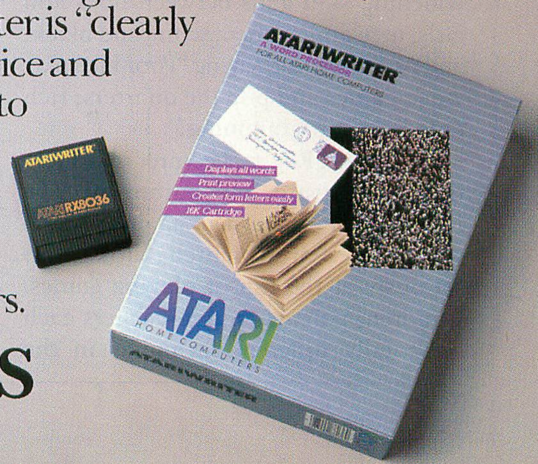
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VIDEO GAMES VISIT HARVARD YARD *continued from page 24*

At the conference the gritty question of the *value of video games* became clouded. Entertainment and fun as legitimate purposes were discussed interchangeably with serious instruction and learning, often making it difficult to arrive at a consensus or to promote vigorous debate.

The environments in which video games are played (including arcades, neighborhood stores, classrooms, and private homes) were discussed. The two reports presented on this theme however, provided only preliminary data describing the quality of experience for children and youth in those environments.

Another report considered the rehabilitative uses of video games for the chronically orthopedically handicapped, the learning handicapped, and for juvenile delinquents. But again, some confusion resulted when researchers did not distinguish between video games and educational software in describing these generally successful rehabilitative programs.

There were demonstrations of gamelike educational materials still in the design and development stage which encourage exploration, creativity, independence, and logical development. These demonstrations stimulated additional enthusiasm among conference participants and concerns about themes of violence and war (themes which characterized many of the early video games) were partially eased by these clearly non-violent games and learning materials.

Herb Kohl, a California educator/writer turned computer buff, discussed the need for sociological research to monitor the cultural effects of personal computers as potential machines of social inequity. He warned about the widening skill gaps between boys and girls, men and women, white and black, and rich and poor, saying "Poor kids play video games and pop the quarters; rich kids learn programming."

Dr. Robert Kegan, Lecturer in Education at Harvard and author of *The Evolving Self*, warned against social science research which looks too seriously at the fun of playing games. Children, parents, and reseachers each see totally different meanings in the games, he said. We need to understand youth culture separately from adult culture, and he charged adults with projecting their experiences, fears, and fantasies onto the video game scene. He admonished that neither video games nor television can deliver the magic and glitter initially promised to the young, and he warned against the possibility of social isolation and loss of community among a generation of video-game players. On the brighter side, however, he cited potential worthwhile outcomes such as developing a sense of personal competence, reconstructing and renewing relationships with parents and others, experiencing power and control in the face of threat and chaos, and finally developing useful skills of concentration and logical analysis.

My own report covered recent research on the effects of video games on families at home. In a small random sample of families I found that games were kept in perspective with other family activities and tended to be played at times when family members would otherwise watch network television. I found no detrimental effects on school achievement, homework routines, or extra-curricular interests. Indeed, half of the families reported a positive effect on the children's school progress, but I pointed out that this was based on subjective parent and child opinion supported only by personal accounts. My research also found that mothers played significantly less than other family members, and girls played less than boys. However, females of both age groups developed skills when they committed time to practice and deliberately exerted an effort to improve their scores.

Dr. David Brooks, an instructor at the University of Southern California, reported that the widely-held public opinon that arcades are places for drug dealing and school dropouts is inaccurate. He reported that few of the more than 900 youths in his study were failing in school or were truant.

Antonia Stone, a former teacher who received a Ford Foundation grant for a national study of the use of computers in prisons, described how video games were being used to facilitate social rehabilitation of juvenile delinquents.

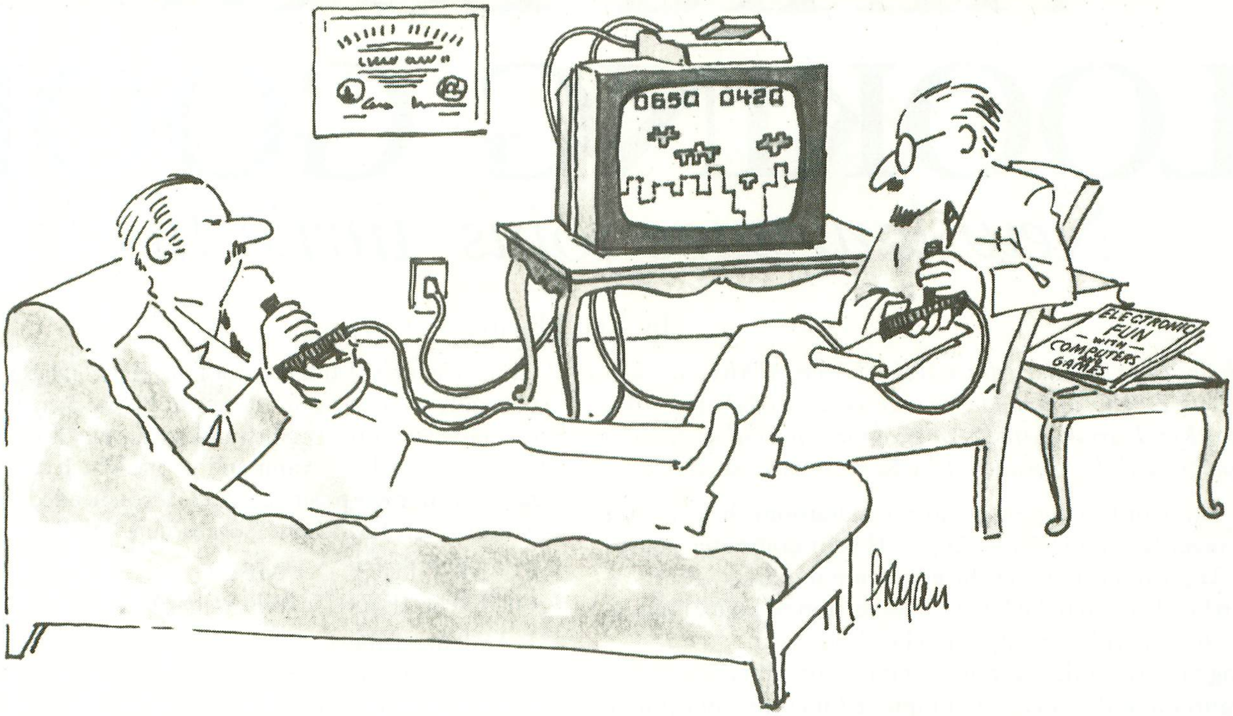
In a similar vein, four medical researchers reported positive effects of video games in medical settings. Dr. Steven Leff, a psychiatrist at Harvard Medical School, Dr. Sylvia Weir, a physician/researcher on learning in handicapped children with MIT, Dr. William Lynch of the Brain Injury Rehabilitation Unit of the Veterans Administration Hospital in Palo Alto, and Emanuel Donchin at the Cognitive Psychophysiology Laboratory at the University of Illinois, all reported gains in learning, improvements in skill, and improved social behavior among subjects in their studies of video game use in clinical therapy.

Alan Kay, Vice President and Chief Scientist at Atari, Inc., closed the conference by focusing on an emergent conference theme. He emphasized a view of computer games and computer explorations as "learning" rather than as "education". He defined learning as a process that goes on *inside* a person, rather than a process which goes on *around* him in a prepared environment. The distinction between instruction and learning is one which has important implications for schools as teachers and children interact more and more with computers.

The new directions in video games and computer programs which were presented at the conference illustrated Kay's vision of learning and gave impetus to the replacement of skepticism with optimism regarding computer games. Independent designers of software who gave previews of materials based on exploratory learning added still more optimism. Many of the more creative educational programs seen at the conference were designed for young children.

It is clear that the small computer (and software) industry is still in the "Model A motorcar phase". The product potential is clear, and the directions which this industry might take can boggle the mind, although no one at the conference proposed regulation, legislation, or reiterated dire warnings and public policy issues. Indeed, there was a consensus that software products needed to be shaped by people with a human development perspective, not left to technicians or computer programming specialists. Above everything else, the conference made it clear that more research and data are needed about video games and video education, a phenomenon which has certainly had a sudden and dramatic impact upon our real world.

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ATARI LOGO LOOKING GOOD

New language joins Turtle tussle

by Ken Harms

With this issue, our department PILOT Your ATARI will alternate with LOGO, both under the surveillance of Contributing Editor Ken Harms. Articles or programs for either of these languages will be considered by Ken, in care of ANTIC.

The buzzword to cope with in the classroom these days is no longer "computer," it's "Logo." If your computer doesn't have Logo you can forget the educational market. Atari has taken heed and marched in with its version of Logo, built into a 16K cartridge, ready for school this year.

Logo is a versatile computer language designed to ease exploration and discovery of computer functions and power. It is easy enough for children to use, yet complex enough to permit very advanced work by expert programmers. It sidesteps the cumbersome rituals of BASIC — its most serious competitor in the classroom.

Based on LISP, the most powerful of the artificial intelligence languages, Logo has been in development for about ten years, principally by Seymour Papert at MIT, and by Logo Computer Systems, Inc. of Quebec, Canada. The development of Logo is a story we won't go into. Suffice it to say that most of the popular micro computers have a version of Logo, some of them several versions. Atari Logo, from Atari, Inc., is the first for ATARI computers, and though it is a latecomer, it is a good one. It runs on all ATARI computers (even the 400 with 16K RAM) and sells for $99.95.

Atari Logo gives the user extraordinary power to manipulate and create lists of words. A simple yet elegant turtle graphics system allows even novice programmers to create microworlds and explore them. Imagine a BASIC which would allow you to create new commands — Logo does just that!

Why Logo?

So why Logo, anyway? Simply put, Logo is the language of learning. It is designed to be easy to begin. Like PILOT, a few simple graphics commands move a "turtle" around the screen to create beautiful designs; a few text manipulation commands allow construction of sophisticated question-and-answer quizzes or games. In brief, Logo has a low threshold.

But, like the piano which can be played at a simple level, while also serving as the instrument of Liszt, Logo has no ceiling. The individual author creates new commands (called "procedures") and incorporates them in later programs as naturally as a boy puts stones in his pocket. Let's illustrate this latter feature with a simple example. Logo does not include an "absolute" command — one which converts negative numbers to their positive values. If you needed this often, you would teach Logo how "to absolute" as follows:

```
TO ABSOLUTE :NUMBER
OUTPUT IF :NUMBER <0[ - :NUMBER] [NUMBER]
```

As defined above, the procedure ABSOLUTE will take any number and if that number is less than 0, output the negative of the number (a negative of a negative is a positive, so one gets a positive number). If the number is greater than 0, it outputs the number (which is already positive).

Using our new command is simplicity itself. For instance "PRINT ABSOLUTE – 3" prints a "3." Later, the command could be used in any new programs just as simply. There is no need to recode the command, change line numbers or use complicated GOTOs or PERFORMs.

Logo is often self-documenting; i.e., it is easy to read compared to BASIC or other less structured languages. In Logo, a problem is automatically written as a series of small procedures which talk to one another in a simple, direct way to produce the overall output.

Yet, unlike PASCAL and the similar "structured" languages, Logo is interactive — you can instruct it to do something and immediately see the results without compiling programs, etc. This makes it easy to write and debug programs.

Logo's design welcomes experimentation. Throughout, the word "error" is not used. For instance, if the command ABSOLUTE had not been defined, and you issued the command ABSOLUTE – 5, Logo would respond with "I don't know how to absolute." Other messages are similarly positive — "You don't say what to do with . . . ," "PRINT doesn't like XXXX as input" or "file XXXX not found." (Boy, won't you miss the old "ERROR 170"!)

As a friendly language with virtually no prerequisites (anyone can do interesting things right away) and no limits (no one gets bored), Logo has found a natural home in schools. It deserves a similar place in home computing. It, and PILOT, are critical tools to teach more than programming — they develop logical thinking.

Atari Logo

Let's turn to Atari's Logo. Programmed permanently into one of those nearly indestructible cartridges, Atari Logo appears much more durable than the disk-based versions for Apple or the Commodore 64. Atari Logo can operate completely effectively with a cassette-based system and as little as 16K of memory (TI Logo needs 48K RAM). As a result, an Atari start-up package is much cheaper than virtually any other Logo system.

As I prepared this article, I poured through material on three versions of Logo for Apple, one for the TRS Color Computer and one for the Texas Instruments TT 99/4A. Without exception, the Atari product offers advantages over each of these products.

That's a pretty strong statement, yet I feel it's easily supported. Simply put, Atari Logo benefits from being late on the scene and thus incorporates advanced features. It builds on the superior sound, graphics and keyboard capabilities of the 800/400 systems (compared to alternative machines).

Other Logos

Logo in general offers two outstanding programming features — turtle graphics and list processing. Although graphics are undoubtedly the initial exposure for most people, the language's true power becomes apparent with the extensive set of commands to control lists of words (sentences) in a learning environment. The Color Computer's Logo does not even have list-processing capabilities. It's a bit like a BASIC with numeric computing but no graphics. In the old days (say, 1979), people tolerated that limitation; they don't have to anymore, and neither should today's Logo user. To be fair, the Color Computer's multiple turtles represent an extremely nice implementation of turtle graphics, but it is only half a language, in my opinion.

TI's Logo offers an exclusive feature — "sprites." These 32 objects can be moved around the screen independently of the background or each other. Sprites can be given headings (direction) and also speeds — they move in a straight line until told to change — without slowing down the program. But they cannot draw lines like turtles. TI's Logo makes it easy to redefine character shapes and, to a limited extent, their colors. However, since the TI relies on character graphics rather than memory-mapped graphics, the TI turtle "runs out of ink" rather quickly. As a further limitation, the TI Logo operates only on whole numbers between −32768 and 32767. Although simple beginning programs may not require more, most people will quickly find it a limiting feature. (PILOT is also "integer only," and I find this an inconvenience all the time.) Finally, TI's program editor, sprite and character editors appear to be substantially less convenient to use than those of either the Atari or Apple Logos. I believe that they would be especially frustrating to new users.

Apple II+ users are offered three versions of Logo. Although this isn't the place to analyze these deeply, an overview seems in order. All three, Terrapin Logo, Krell Logo and Apple Logo, are full-scale implementations of the language with competent graphics, list processing and editing facilities. In fact, the three are very similar, as one would expect, since they are produced by companies with similar heritages from MIT and the inventors of the Logo language.

That's the good news about the Apple Logos. The bad news is that Apple hardware and software for any of them will cost you well over $2,000. Each requires an Apple II+ with language card, disks and an RF modulator. That compares to recent prices of less than $300 for an ATARI 400 with cassette, or less than $1,000 for the 800 with a disk drive. A school, for instance, could buy two or three ATARI systems for the price of one Apple, an attractive deal even if the cheaper systems weren't quite as good. Atari's Logo is at least equal to and, for most people, far better than any of the Apple Logos.

Turtles

The most easily recognized advantage will be Atari's four (count 'em, four) turtles. That compares to Apple's single turtle. But Atari's turtle advantage is far more than numbers. A normal, "boring" turtle can move, draw lines, erase lines, show or hide itself, and set a particular heading. The Apple systems have one normal, boring turtle.

"Dynamic" turtles can do everything boring turtles can do, plus they can change color, change shape, and can be set in motion at a given speed. In essence, they're a cross between sprites (which can't draw or rotate to show headings) and normal boring turtles. And Atari Logo has four dynamic turtles! The care with which this was implemented is illustrated by the screen representation; the turtle looks like a cute little turtle, not a triangle. Atari's full picture of a turtle not only makes it easier to tell headings but immediately captivates younger programmers with a "real" turtle.

As a result of the Apple's hardware limitations, the Apple Logos do not appear to support sounds in high-level language — an assembly language routine must be written to produce sounds. Atari Logo features full tone quality on two sound channels. The superior tonal quality was obtained by hardware mixing two of the usual voices for each channel. While BASIC programmers may miss the four voices, they'll love the new "duration" feature. When giving Logo the command TOOT and telling it which voice to use and note to play, you also tell it how long to play that note. Your program can then go off and do its thing while the music continues to play. Nice!

Now one might say that the four turtles and sounds are non-essential. Right, but they open an entire galaxy of new microworlds. A four-player joystick-controlled road race game with acceleration, deceleration, turning, different colored cars shaped like cars, and full sound effects can easily to constructed in 50 lines. It's a project well within the capability and interest span of third graders. Even simple turtle-graphics displays can be easily animated.

High Commands

These displays are made easy by some of Atari Logo's exclusive

continued on next page

high-level commands. Paddles and joysticks are fully supported, as you'd expect (not so on Apple). An EACH command gives the same instructions to all active turtles and lets them perform the entire set one at a time. For instance, if the instructions draw a box, the first turtle would draw the complete box. Then the second turtle would draw the box, and so on. Essentially, the first turtle completes all instructions before the second turtle does anything.

The ASK command, on the other hand, allows all the turtles to execute the list of instructions simultaneously! Actually, the first turtle does one instruction in the list, then the second turtle does that instruction, etc., until all named turtles have completed the first instruction. Then the first turtle does the second instruction and the process repeats until all turtles have completed the list. The effect is wonderful — up to four figures drawing at the same time.

As you might expect, Atari's 128-color pallet is much better than Apple's seven, but there's even better flexibility. With Atari Logo, each line is drawn with a specified pen. As in the other systems, you can change pens, and thus the colors, of the lines to be drawn. The Atari advantage shows up in the SETPENCOLOR command which allows you to change the colors of lines already drawn. This is a "color register" change so it does the entire screen instantly. The Atari supports three simultaneous pen colors, the Apple five (not including backgrounds).

I found the Atari turtle-shape editor easy to use. It displays a large-scale image of the old shape and uses simple cursor controls to design a new shape. The shapes can be animated or moved at will. They draw lines just like the usual turtle.

Even better, Atari Logo lets you use Atari's "collision registers." This is done by setting up a WHEN demon to watch your screen, continuously looking for an event such as a turtle touching another, a specific joystick movement, or a turtle touching a line. Some 20 different specific conditions can be monitored, with different specific actions taken whenever the event occurs. You set up demons only once. Thereafter, they look for the conditions and execute the instruction list whenever the event occurs.

All in Family

I also compared the power of Atari Logo's list processing features to Apple Logo. Since Atari Logo was developed by Logo Computer Systems, Inc. (LCSI), the same people who wrote Apple Logo, it bears an extremely close resemblance to that product. For my money Atari Logo's "non-graphic" command repertoire is essentially as useful as the Apple systems', yet considerably easier to use.

Krell/Terrapin includes nice error trapping commands (CATCH and THROW) which could be really useful. Also helpful would be the DEFINE command to define new procedures under program control (Atari supplies a procedure to do this). Only Krell/Terrapin allows you to save and recall screen pictures to and rom a disk file. These provide a GO command to jump around within a procedure (okay, I'll admit that it's a poor programming technique — which is probably why Atari didn't include it). The TRACE command found on Krell/Terrapin allows you to step through a program one instruction at a time. Finally, Apple Logo provides a PACKAGE command to manipulate groups of procedures and variables simultaneously, and the ability to redefine the primitives themselves.

How important would these be to you? TRACE is very nice, in my opinion. As for the rest, Apple Logo lists them in the "rarely used" section of the reference manual. Almost all of these affect the process of programming, not the product itself.

As for the process of programming, my review indicates that Atari's superior keyboard already makes it far easier to use than any of the Apple Logos. That's true despite LCSI's obvious use of Apple-like control keys in some instance.

Without special hardware, the Apple gives only uppercase letters. Atari, of course, gives both. Most educators consider early introduction of both sets of letters educationally advantageous.

Logos are heavy memory users. Atari Logo, however, seems very efficient. Under Logo, your programs use "free workspace memory" which is measured in "nodes" of five bytes. A 48K ATARI system provides at least 26%, and sometimes up to 100%, more free workspace memory than the Apple Logos. Consequently, you can run more complex programs.

Backup

Support for users is often a problem with any computer product. Not so with Atari Logo. First, the package includes an excellent tutorial in the 160-page "Introduction To Programming Through Turtle Graphics." Next, Atari Logo provides an in-depth review of the language in a 210-page "Reference Manual." Both of these have excellent indexes and useful examples. Probably as useful as either is the 16-page "Quick Reference Guide" which not only gives the form of each command but also explains it. A very important Atari exclusive is a live human Logo specialist at Atari's Customer Support number, 800-538-8543.

The close similarity between Atari Logo and Apple Logo gives us a nice side effect — virtually all of the Apple Logo programs and books written by or for LCSI systems will run on the ATARI with essentially no change. Krell/Terrapin programs need only trivial changes. TI Logo is the oddball here and requires moderate rewriting. I tested the Apple Logo compatibility by typing over a dozen programs from The Young People's Logo Association, magazines, etc; all ran perfectly.

This means that you could use any of the LCSI-oriented books easily and immediately. This not only makes a great many support materials available but also makes it relatively easy to operate a mix of ATARI and Apple machines in the classroom. All could be exploring the same microworlds, sharing materials and exchanging procedures. (Of course, it won't be long before the kids vie for the ATARIs because of their superior turtles and sound!) Parents could buy ATARIs knowing that their children's Apple classroom work could be

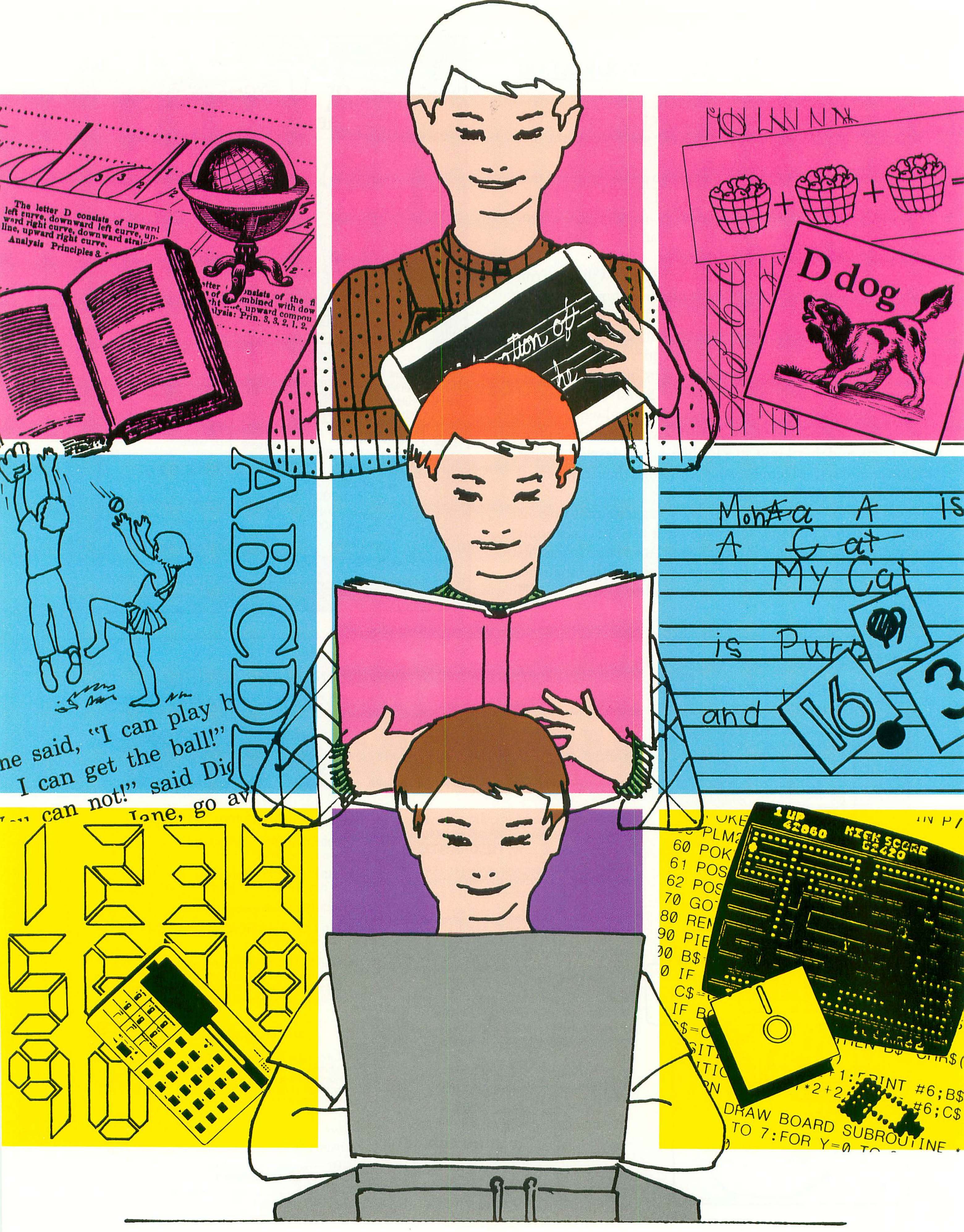
brought home, and vice versa. (Of course they might ask why the school district bought such expensive machines in the first place!)

We'll cover books in a future article. So far we've heard that *Apple Logo* by Abelson (Byte Books) and *Apple Logo: In Invitation to Art and Patterns in Nature* by Thornburg (Addison-Wesley) and *Learning With Logo* by Watt (Byte Books) are some of the best.

Some of you will ask the burning question, "Will Logo run on the new ATARI machines?" We have assurance from the Atari Logo Product Group that Logo will indeed run on the entire XL line, as well as on the older models.

There is also a significant educational question, "Does Logo really enhance learning?" Let me finish by quoting Robert P. Weiss, PhD, a school principal in the Santa Clara School District. "I cannot think of an educational goal which is not enhanced by Logo. There is no limit to what children can do with Logo, and they know it! Kids like it, and develop a sense of power and self-esteem because with Logo they can control their environment."

This kind of endorsement strongly suggests that Logo is and will be *the* computer language most used in classrooms for many years to come. We recommend Atari Logo to parents and educators as a finely implemented version of the language, completely suitable for use at home and in school.



The letter D consists of upward
left curve, downward left curve, up-
ward right curve, downward strai
line, upward right curve.
Analysis Principles 3.
Ddog
ABCDE
ne said, "I can play b
I can get the ball!"
can not!" said Di
Jane, go av
My Cat
is Pur
and
DRAW BOARD SUBROUTINE

Computers in Education

Benefit or bombshell?

by JOHN and MARY HARRISON

"Our nation is at risk. The educational foundations of our society are being eroded by a rising tide of mediocrity. If an enemy power had attemped to impose on America the mediocre educational performance that exists today, we might well have viewed it as an act of war. We have, in effect, been committing an act of unthinking unilateral educational disarmament. History is not kind to idlers."

This assessment by the National Commission on Excellence in Education has received widespread press coverage. We repeat it here to emphasize present educational problems and the need to explore alternatives and improvements in the way a child is educated. This is especially pertinent since one of the commission's recommendations is for all students to have a half-year computer science course.

No one can deny the explosion of the microcomputer industry over the past ten years. TIME magazine named the computer its "man of the year". Computers influence the games we play to the movies we watch. This potential just waits to be tapped to improve the quality of education. As parents, educators and ATARI users, we intend to explore the role of the computer in the revitalization of the education process.

John and Mary Harrison are parents, teachers and ATARI hobbyists. Mary teaches math and computer science at the high school level. John holds an M.S. in computer science and develops educational software. They will be coordinating the Education Department for ANTIC.

HISTORY

Ever since the development of ENIAC by the University of Pennsylvania in 1946, the role of the computer has expanded to encompass tedious or dangerous tasks. Originally designed as an electronic calculator to solve complex mathematical formulas, today the computer can be found performing numerical computations, inventory control, point of sale transactions, manufacturing operations, word processing, and a variety of chores in the home. Of all the uses for computers, their role in education has generated the most controversy.

One of the first educational applications was designed by Patrick Suppes in the mid 1960s. A series of programs to drill arithmetic facts for elementary school children was developed and tested. This modest beginning touched off the debate that continues today about the proper role of the computer in the classroom. Regardless of the answer, it is certain that the microcomputer will be a permanent fixture in the classroom of tomorrow.

continued on next page

Computers in Education

The spread of the computer's influence on society is due largely to the major advances in electronics technology. The first electronic digital computer, ENIAC, covered 1500 square feet, stood nine feet high, weighed 30 tons, contained over 18000 vacuum tubes and was able to perform 350 multiplications per second. Today's ATARI 800 microcomputer covers about one square foot, stands 4.5 inches high, weighs ten pounds, contains no vacuum tubes, and can perform about 300,000 additions per second. Meanwhile, as computing power increased, prices decreased. The ATARI 400 that sold for $630 three years ago is now available for under $100.

Not only are microcomputers inexpensive, they are more reliable than their larger and more expensive ancestors. Schools are taking advantage of this trend, buying computer equipment in ever larger quantities. Families, too, are buying computers, providing their children with an introduction to computers even before the schools. The rush to computing has almost obscured the important question: How are computers to be used in education?

TWO VIEWPOINTS OF COMPUTERS IN EDUCATION

There are two generally accepted applications for the computer in education: as a dispenser of education and as a tool. To date, the emphasis has been upon the student as a recipient of information from the computer. This application (also known as Computer-Aided Instruction — CAI) can be seen in the original work by Suppes as well as most of the educational programs on the market today. Although the packaging of today's programs may be more sophisticated, the basic tenet remains the same — the computer presents the problem, the child responds, the computer evaluates the response and the process repeats.

This is the basis for drill and practice programs. These programs allow a slow student to repeat an exercise without embarrassment or ridicule. Other students can practice new concepts to reinforce instruction already received. Since the computer, as well as the student, immediately recognizes a correct response, the program can adjust the difficulty level of successive problems.

The logical extension of drill and practice programs is the tutorial. Here, the student is introduced to new information in a series of lessons. Following each lesson, drill and practice routines are used to reinforce the material. The advantage of this method is that it allows the student to progress at his or her own rate. Lessons can be repeated to gain mastery of the topic. Well-designed tutorials include both a pretest and a post test. The pretest determines whether the student has the prerequisite skills, or sufficient knowledge to bypass that lesson. The post test is used to determine the retention of the material.

A third type of CAI is gaining popularity — the simulation. The computer mimics a real world situation and poses options to the student. The computer evaluates each decision and determines its effect. The program may then prompt the user with another question. The student must develop logical reasoning to successfully pilot the simulation. The major advantage of simulations is that they allow the student to repeat the process and vary responses in an attempt to determine the correct combination of choices to reach the desired goal.

Considerable research has determined that these methods do affect a student's real understanding of the concepts presented. However, to regard the computer only as an electronic workbook or sophisticated teaching machine does not begin to tap its potential. No one knows the uses to which the computer may eventually be put, but new applications are emerging regularly.

The computer can be manipulated by the student to explore ideas and draw conclusions. In this way, the student becomes an actual participant in the learning process rather than passively receiving knowledge from the computer.

The idea of active student participation was explored by the University of Pittsburgh starting in 1969. Supported by the National Science Foundation, Project SOLD was organized into five laboratories — computer, synthesis, dynamics, logical design, and modeling/simulation. Here a student could combine his knowledge of computer science and mathematics to test an experiment of his own design. The student, rather than the computer, set the pace and made the decisions. This concept is gaining popularity as more computers proliferate in the nation's classrooms. Students use the computer to perform tedious or repetitive calculations in mathematics and laboratory science courses, leaving more time to explore the topic being taught.

The idea of student control at a more elementary level has been the subject of research by Seymour Papert. Using turtle graphics and a programming language called Logo, Papert's group at MIT has been working with children ranging from preschool through college age for over twelve years. The purpose of this research has been to create an environment for exploring computers. Logo was designed as an interactive language to minimize the impact of continually defining and modifying procedures that would be present in a compiled language. An excellent summary of the work done by the Logo Group and some exciting ideas for new directions in education can be found in Papert's book *Mindstorms: Children, Computers, and Powerful Ideas* (New York: Basic Books, 1980).

THE ATARI COMPUTERS

The family of ATARI computers fits into this spectrum of educational uses however the user desires. The excellent sound and graphics capabilities can liven up drill and practice, tutorials, and simulations. The use of color and sound help maintain the student's interest and relieve the boredom of staring at a screen of text.

The ATARI computers are also well suited to the role as a tool. To encourage the beginning programmer, color and sound are easily accessible from ATARI BASIC. Character graphics are available from the keyboard. A wide variety of resolution modes encourage experimentation with line drawings. Hence the student programmer can utilize the graphics and sound capabilities of the machine to design his experi-

continued on page 36

Computers in Education

continued from page 34

ment more realistically or display the results more vividly. The ATARI also has the processing power to perform the tedious calculations often found in mathematics and science courses.

To bring the excitement of programming to a wider audience, ATARI PILOT and ATARI Logo are available. Both languages support turtle graphics and encourage structured program development. Since a sophisticated mathematics background is not required, young children and adults are able to quickly grasp programming concepts. Thus the ATARI can provide the environment for exploration similar to that developed by the Logo Group at MIT.

An additional use for the ATARI machines is in word processing. Errors and changes in text, once the bane of all writers, are easily handled with a word processor, and there are several good programs for the ATARI. This removes at least some portion of the dread of preparing reports because the writer knows that each page will only need to be typed once.

The independent software houses have finally recognized the potential of the ATARI computers. There has been a software explosion to accompany the hardware boom. Everyone from major publishing houses to occasional users are producing educational software. But children and beginners are not the only beneficiaries. There are many programming languages available for the ATARI owner besides BASIC, PILOT, and Logo. These include Pascal, LISP, Forth, C, and machine language assembler/editors. Combined with the huge selection of books and manuals covering every facet of the machine, the ATARI becomes one of the most versatile microcomputers on the market.

PARENTS AND TEACHERS

If the commissions's recommendation for community involvement is to be taken seriously, what are the implications for parents and teachers?

Parents are a child's first teachers. In some respects they will know their child better than anyone else ever can. The examples parents provide, the priorities they set, and their attitudes towards school deeply infiuence their child's academic and social behavior.

There are several stages in a child's development, many before age six. Several child psychologists have theorized that an enriched early childhood may foster readiness for school. This is the motivation behind "Sesame Street", Head Start, Montessori and other preschools. Certainly an early exposure to computers through friendly educational games should be a rewarding experience.

Parental involvement with a child's education must not stop with the first grade. The computer explosion has caught teachers by surprise almost as much as it has parents. Some educators fear computers, and for various reasons. Some doubt their own ability to learn computing. Some feel that computers may reduce the need for teachers, or diminish the teaching role. Certainly some of the effects of the computer in education will be difficult for the traditional teacher. Still, nothing can replace human kindness and the real concern of a teacher for students. The computer will assume the clerical tasks associated with attendance, day-to-day record keeping, grade calculations, and if cleverly programmed, may seem to relate personally to students. With the support of the computer, the teacher will be better able to guide each student's progress. The weak student need not automatically fail. The gifted need not be bored. All students should benefit from the greater variety of materials to which the teacher has access.

ANTIC'S RESPONSE

Recognizing the influence of computers on education in the home as well as in the schools, ANTIC has renewed its commitment to education. Over the next few months you will notice changes in the amount and content of education-oriented articles and programs that appear. As a result of this reorganization, we intend to pursue the following areas:

1. Articles discussing how to write or evaluate educational software.
2. Reviews of educational software on the market, pointing out the strengths and weaknesses of each product.
3. Reintroduction of the kid's page. Though still by and for children, we envision this as a place for the parent and child to discuss and submit questions, answers, and programs.
4. Educational software by ANTIC readers for other readers.
5. Other articles that reflect the educational uses of computers.

In order for this effort to succeed, we need your support. We hope to establish a dialogue between us so that our articles are timely and relevant. Please tell us what you want to see in an education department. We will make every effort to address the desires of the widest possible audience while providing a service to all age groups. Please, take the time to get involved and help us make ANTIC your computer magazine.

NEXT MONTH IN ANTIC

Sports Games Issue • Track Star Game • More Interrupting Assembly Language Game • AUTORUN for Cassettes

OBJECT CODE TO STRING

Using assembly language in BASIC

by JERRY WHITE

This article and its associated programs will be of interest to those who use (or plan to use) assembler subroutines within ATARI BASIC programs.

It is often a good idea to put assembler (machine language) subroutines into a string. If the subroutine does not have to be stored at a specific address, it may then be called from within a BASIC program using a command such as JW = USR(ADR(ASM$)). Assuming that the assembler subroutine has been stored in a string called ASM$, this command tells BASIC to locate and execute.

The OBJ2STR BASIC program will read an object code file from disk and convert it into a string for you. If you are beginning to learn assembly language, or if you'd like to start now, enter the SOUNDOFF.SRC program using your SYN-ASSEMBLER or Atari Assembler Cartridge. If you don't have an Assembler yet, I highly recommend SYNASSEMBLER from SYNAPSE SOFTWARE over the Atari Cartridge.

Assuming that you now have an object code file called SOUNDOFF.OBJ, and that you have SAVEd the BASIC OBJ2STR program, we will now RUN OBJ2STR and convert our object code into a string. When entering names for your input and output disk files, OBJ2STR will assume that you intend to use disk drive number one. You do not have to type "D:" before the filename. You may use drive two if you so desire by entering an input filename such as D2:SOUNDOFF.OBJ. I recommend that you use the same filename for both input and output files, but with the extension .OBJ to indicate the input OBJect code, and .LST to indicate the output string file, which will be in the form of untokenized or LISTed ATARI BASIC.

You must then supply OBJ2STR with a starting line number for your BASIC string. You may simply press [RETURN] to use the default of line number 31000, or type over this number with any number from 1 to 32700.

Once this has been done, OBJ2STR will display the message, "I'm working on it!", until the task has been completed. Upon completion, the program will proudly display the message "I DID IT!", and position the cursor over the word "NEW".

Assuming that you have saved the OBJ2STR program, you may now look at the BASIC string you have just created by pressing [RETURN] three times. Since the cursor is over the word "NEW", pressing [RETURN] the first time will delete OBJ2STR from memory. The cursor will then be positioned over an ENTER command. Pressing [RETURN] the second time will ENTER your string from disk into RAM. Finally, the cursor will be positioned over the word "LIST". Guess what pressing [RETURN] will do now.

If you used SOUNDOFF.OBJ as your input, you will now see three lines of BASIC code on your screen. The first will be a DIM statement. The second will be a string equate statement, and the third will be a RETURN. I suggest that you rename ASM$ to something more descriptive such as SOFF$. Depending on your program, you may or may not need the RETURN line.

Notice that the string length is 12. Since we needed only one line to define this tiny subroutine, you could save some RAM by putting both the DIM and the equate code on the same line. You may also delete the string position code "(1)".

After using the OBJ2STR program, did you find it to be useful? Do you have any questions about Atari Basic? Would you like to see more tutorials on Basic and Assembler? The answers to these questions would be helpful in providing subject matter for future issues of ANTIC. If there are specific topics you would like me to write about, send your letter to Jerry White, c/o ANTIC, 600 18th St., S.F., CA 94107.

continued on page 39

OBJECT CODE TO STRING *continued from page 37*

```
1 REM OBJ2STR 4/7/83 BY JERRY WHITE FOR ANTIC MAGAZINE
100 GOTO 320
110 SLINE=SLINE+LINC:IF SLINE>32767 THEN POP :? :? "   LINE NUMBER OVERFLOW.":END
120 RETURN
130 GET #1,LO:GET #1,HI:WD=LO+HI*256:RETURN
140 GOSUB 130:IF WD<>65535 THEN ? :? "  NOT BINARY LOAD FORMAT":END
150 GOSUB 130:SA=WD:GOSUB 130:EA=WD:SIZE=EA-SA
160 ? #2;SLINE;" DIM ASM$(";SIZE;")"
170 FOR JW=1 TO SIZE STEP 80:IF JW+80>SIZE THEN COUNT=SIZE-JW:GOTO 190
180 COUNT=79
190 GOSUB 110:? #2;SLINE;" ASM$(";JW;")=";CHR$(34);
200 FOR ME=0 TO COUNT:GET #1,CHAR
210 IF CHAR=34 OR CHAR=155 THEN SPEC(SPEC,0)=ME+JW:SPEC(SPEC,1)=CHAR:SPEC=SPEC+1:CHAR=32
220 PUT #2,CHAR:NEXT ME:PUT #2,34:PUT #2,155:NEXT JW
230 IF SPEC=0 THEN 260
240 FOR JW=0 TO SPEC-1:GOSUB 110
250 ? #2;SLINE;" ASM$(";SPEC(JW,0);",";SPEC(JW,0);")=CHR$(";SPEC(JW,1);")":NEXT JW
260 GOSUB 110:? #2;SLINE;" RETURN"
270 CLOSE #1:CLOSE #2:? CHR$(28);CHR$(156);:? ,"I DID IT!":POKE 752,0
280 ? :? "NEW":? :? :? "ENTER";CHR$(34);FILE$;CHR$(34):? :? :? "LIST"
290 FOR JW=1 TO 9:? CHR$(28);:NEXT JW:END
300 ? :? "UNABLE TO OPEN ";FILE$:GOTO 340
310 ? :? "UNABLE TO OPEN ";FILE$:GOTO 380
320 GRAPHICS 0:DIM FILE$(15),FLIN$(15),FLOUT$(15),SPEC(256,1)
325 POKE 710,144:POKE 709,12:POKE 82,1:POKE 201,11:SPEC=0:LINC=1
330 ? :? "    OBJECT CODE TO BASIC STRING ":? ,"by Jerry White"
340 ? :? " DISK DRIVE 1 ASSUMED IF NOT SPECIFIED "
345 ? " INPUT FILENAME ";:INPUTFLIN$:FILE$="D:"
350 IF FLIN$(2,2)=":" OR FLIN$(3,3)=":" THEN FILE$=FLIN$:GOTO 370
360 FILE$(LEN(FILE$)+1)=FLIN$
370 TRAP 300:CLOSE #1:OPEN #1,4,0,FILE$
380 ? :? " OUTPUT FILENAME ";:INPUTFLOUT$:FILE$="D:"
390 IF FLOUT$(2,2)=":" OR FLOUT$(3,3)=":" THEN FILE$=FLOUT$:GOTO 410
400 FILE$(LEN(FILE$)+1)=FLOUT$
410 TRAP 310:CLOSE #2:OPEN #2,8,0,FILE$
420 ? :? " STARTING LINE :  31000";:FOR BACKS=1 TO 6:? CHR$(30);:NEXT BACKS
425 TRAP 420:INPUT SLINE:SLINE=INT(SLINE):IF SLINE<1 OR SLINE>32700 THEN 420
430 POKE 752,1:POKE 82,2:POKE 201,8:? :?,"I'm working on it!":TRAP 440:POKE 201,10:GOTO 140
440 ? :? "ERROR ";PEEK(195);" AT LINE ";PEEK(186)+256*PEEK(187):END
```

TYPO TABLE

Variable checksum = 495391

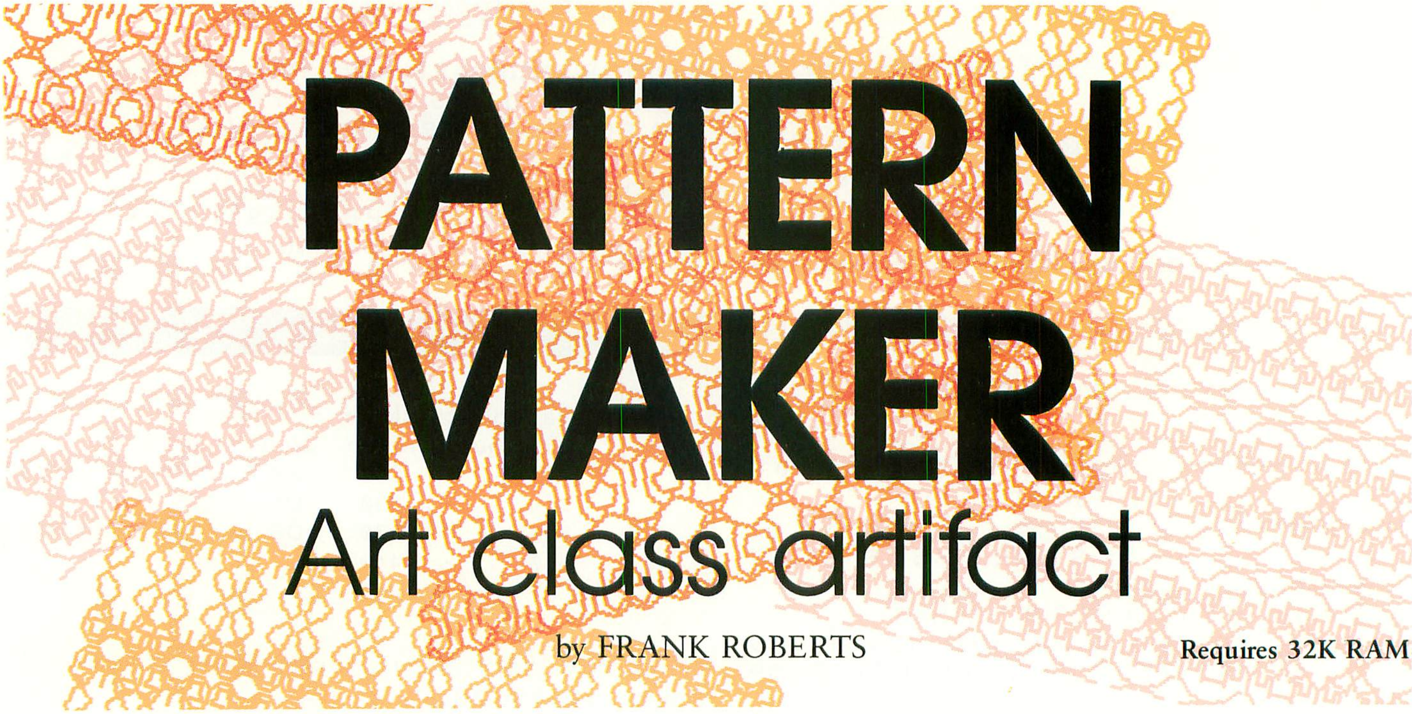
Line num		range	Code	Length
1	-	200	ZK	477
210	-	290	OY	525
300	-	370	OB	537
380	-	440	ZT	510

```
00010 ;SOUNDOFF.SRC BY JERRY WHITE
00020 ;SYNASSEMBLER FORMAT
00030 ;SUBROUTINE TO TURN OFF SOUNDS
00040 ;
00050 ;STORE AS SOFF$ IN A BASIC
00060 ;PROGRAM AND CALL FROM USR
00070 ;JW=USR(ADR(SOFF$))
00080 ;
00090 ;TO CONVERT TO ATARI ASSEMBLER
00100 ;CARTRIDGE FORMAT
00110 ;CHANGE .OR TO *=
00120 ;AND DELETE LINE 150
00130 ;
00140  .OR $600  ;RELOCATABLE
00150  .TF "D:SOUNDOFF.OBJ"
00160 ;
00170  PLA  ;CLEANS UP THE STACK
00180 ;
00190 ;COMMENTS TO FOLLOW ARE
00200 ;BASIC EQUIVILENTS
00210 ;
00220  LDA #0  ;A=0
00230  LDX #8  ;X=8
00240  LOOP STA 53760,X  ;POKE 53760+X,A
00250  DEX  ;X=X-1
00260  BPL LOOP  ;IF X>0 THEN GOTO 240
00270  RTS  ;RETURN
```

COVER CONTEST WINNERS

Name	Prize Chosen
John Brooks	$300
Frank Brandle	Blue Max (Synapse)
Fred Caprilli	Blue Max (Synapse)
Cecilia Gaxiola	Getaway (APX)
Richard Slater	Blue Max (Synapse)
Peter Wickman	Blue Max (Synapse)

Software prizes courtesy of Synapse and APX



PATTERN MAKER

Art class artifact

by FRANK ROBERTS

Requires 32K RAM

As an art teacher I am intrigued with the possibilities of computer-generated art. My students also show a great deal of interest (and aptitude) for creating colorful and unusual shapes on a video screen. There seems to be a special delight in the interaction between TV and student which surpasses the usual forms of art media, such as pencil, paint and clay. While I do not think the computer will *replace* traditional art tools, I do see it taking a rightful — and timely — place beside them. We are at the threshold of new vistas and creations not possible before (a position similar to that held by the first photographers years ago).

This program is a result of an introduction to computer graphics which I do with my art students in relation to pattern making for fiber crafts, such as needlepoint, quilting and rug-making. The program is menu driven and includes instructions. It utilizes two arrays, X$ and Y$, to store coordinates which are "marked" by the user during the design stage. Drawing on the Graphics Mode 7 "sketchpad" inserts the CHR$ of each coordinate into the appropriate arrays. The keyboard cursor (arrow) keys are used to draw the initial design on the sketchpad. Some unique and interesting designs and patterns can be created by plotting points in arcs and curves (see illustrations). When finished with the design, press the [Q] key and the program returns to the main menu.

The main menu shows five additional modes available to the user; mirror image, ink blot, rows of patterns, save design and load a design. The design may be stored as a disk file or on cassette. Mirror image will show the design transformed into a right/left pattern. Ink blot transforms the design into the inversion of the mirror image. Rows of patterns fill a GR.8 screen with three rows of ink blots. This pattern mode, selection 4, takes some time to draw a complete screen — particularly if the sketchpad design is complex. For this reason an escape or abort is provided so that you don't have to sit forever and watch a not-so-successful pattern creep across the screen. Press [ESC] to stop the pattern, then press any other key to return to the menu.

The module beginning at line 1000 stores your original design. Line 2000 begins the retrieval routine. Saving and loading a design in this manner is very fast and economical because only the plotted "S" points are filed; most designs take up less than one sector on the disk or about 20 counter units on cassette. To save a cassette file, press both RECORD and PLAY on the recorder, then enter C: for the filename prompt. When the keyboard beeps, press any key. To load a file use the same procedure, but press only PLAY (not RECORD). Of course, the tape must be installed and queued properly beforehand. The program is structured around the main menu module beginning at line 700. All options enter and exit from this module, including program termination. The modules which perform the various menu options are initialized at the beginning of the program for clarity and RAM economy.

Note that line 860 is reserved for a screen dump command. The dump I use was written for a Prowriter or NEC printer by my friend, Jim Reilly, and is not included here since only those readers owning such printers would benefit. The dump loads into Page Six and operates from a user call. The user will need to supply his or her own screen dump if that option is desired; there are several good ones on the market.

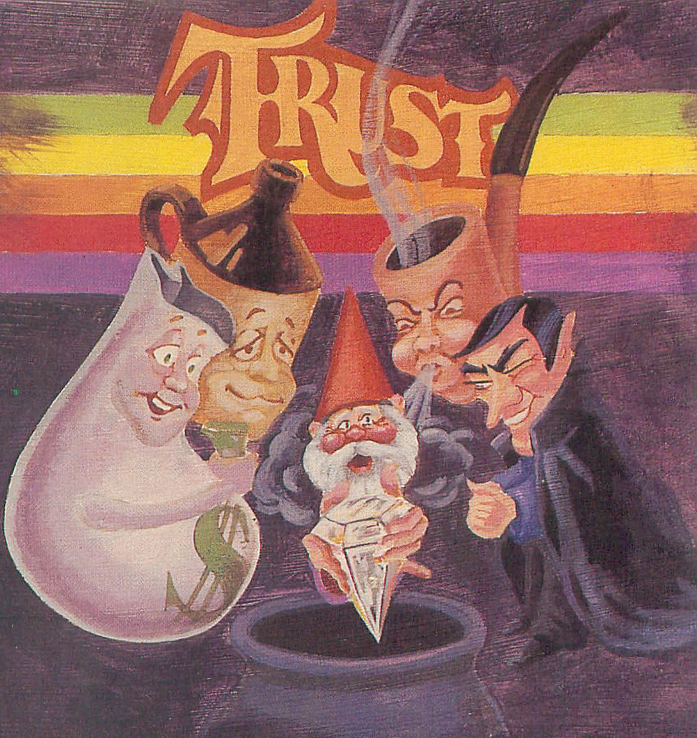
This program is proving itself very useful in designing borders, needlepoints and textured surface renderings. My students are mesmerized by the designs they generate with this program. It has taken a lot of the drudgery out of creating repeated patterns — and taking the drudgery out of it all is what a computer is for, is it not?

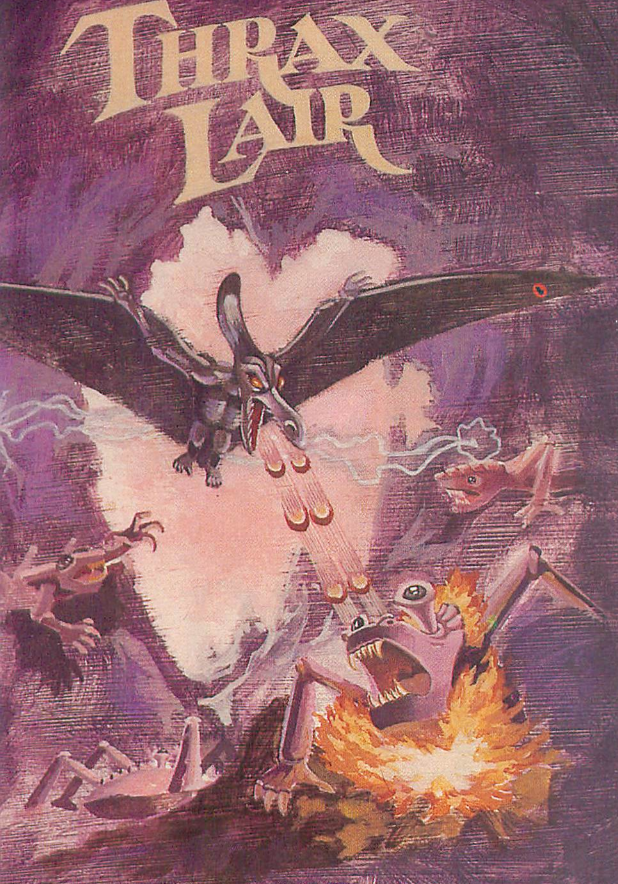
continued on page 43

Frank Roberts is a teacher and software consultant who has written for several computer magazines. He is currently developing art/graphics programs for his own company, Kidstuff Software.

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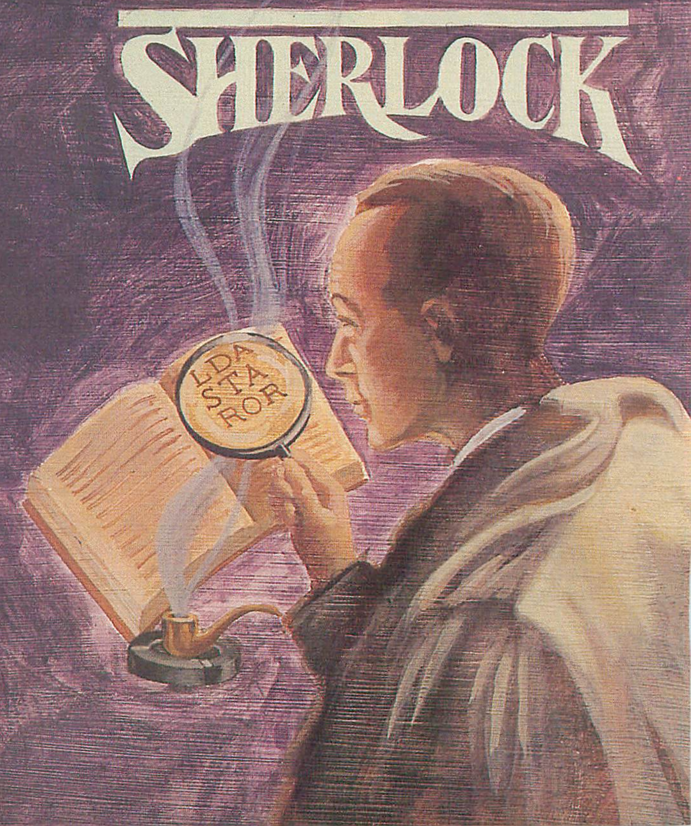
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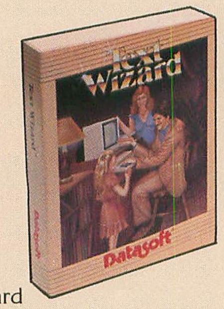
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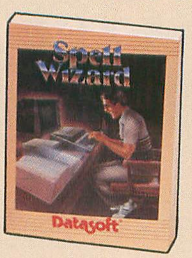
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Check with your local dealer or send check or money order with $3.00 postage and handling (California residents add 6½% sales tax) to:

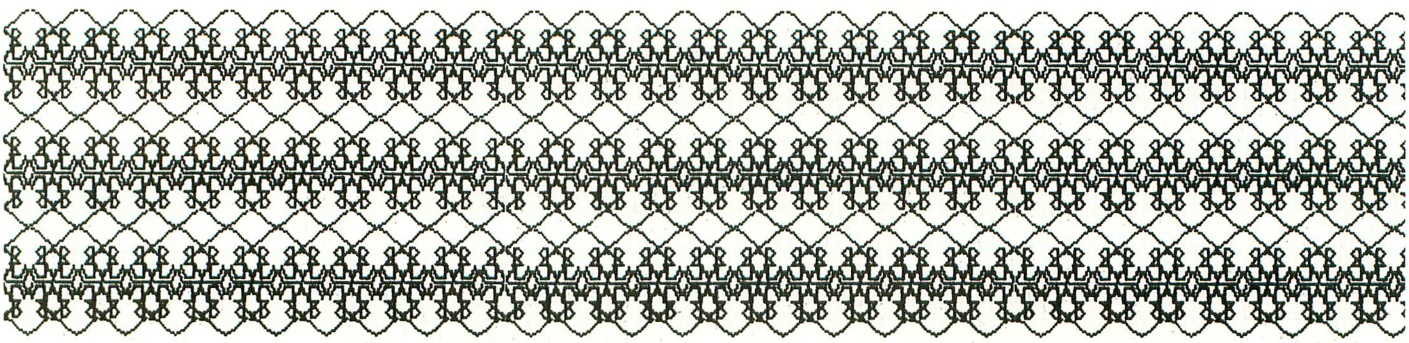
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PATTERN MAKER *continued from page 40*

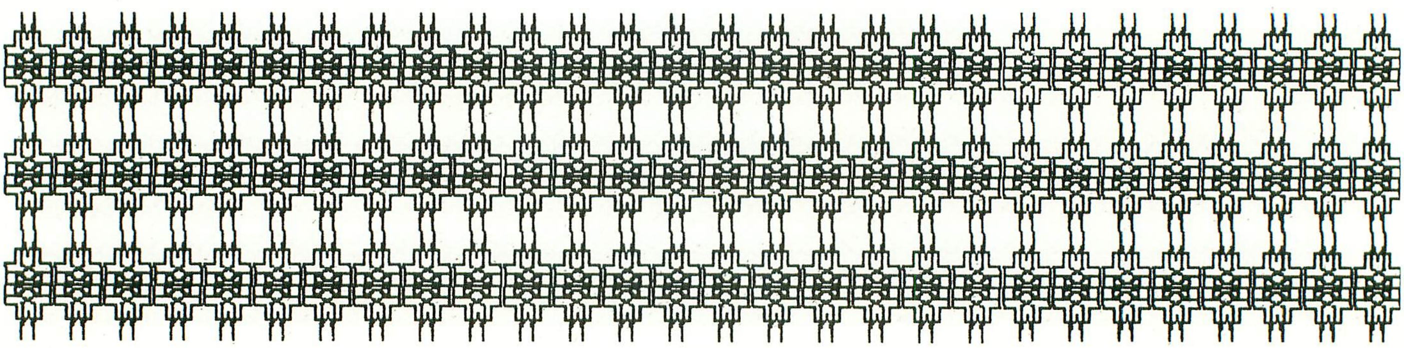
```
10 REM ******************************
11 REM
12 REM D:PATTERNS
13 REM by Frank Roberts
15 REM
16 REM Generates repeated patterns
17 REM from user created designs
18 REM
19 REM ******************************
20 REM
50 DIM FILE$(30),T$(30),X$(1000),Y$(10
00)
55 E=69:S=83:Q=81:UP=45:DOWN=61:RIGHT=
42:LEFT=43:YES=89
58 PLACE=105
60 MENU=700:REM PIVOT OF PROGRAM
62 SKETCHPD=400:REM DRAWS SKETCHPAD
64 MOVE=600:REM ACCEPTS USER DRAWING
66 CHECK=650:REM CHECKS VALID DESIGN
68 MIRROR=800:REM MIRROR PARAMETERS
70 BLOT=810:REM INK BLOT
72 PATTERNS=820:REM PATTERN ROWS
74 MAKE=900:REM MAKES DESIGNS
76 FILE=1000:REM STORES DESIGN DISK
78 FETCH=2000:REM GETS DESIGN FM DISK
80 INSTRUCT=3000:REM INSTRUCTIONS
82 EXIT=4000:REM TERMINATES PROGRAM
84 NAMECHEK=200:REM CHECKS VALID FILE
86 FILERROR=2500:REM FILE NOT FOUND
88 RESPONSE=100:REM CONTINUATION KEY
90 AGAIN=0:GOTO MENU
99 REM ***** GET USER INPUT SUB *****
100 CLOSE #3:OPEN #3,4,0,"K:":GET #3,K
EY:POKE 764,255
102 IF PEEK(694)<>0 THEN POKE 694,0:KE
Y=KEY-128
103 RETURN
105 X=ASC(X$(J,J)):Y=ASC(Y$(J,J)):RETU
RN :REM X,Y COORDINATES
106 A=X+FX:B=Y+FY:RETURN :REM UPPER LE
FT
107 A=(24-X)+FX:B=Y+FY:RETURN :REM UPP
ER RIGHT
108 A=X+FX:B=(24-Y)+FY:RETURN :REM LOW
ER LEFT
109 A=(24-X)+FX:B=(24-Y)+FY:RETURN :RE
M LOWER RIGHT
199 REM ***** CHECK LEGAL FILE NAME *
200 GRAPHICS 1:COLOR 1:POKE 752,1:POKE
 764,255:FOR I=1 TO 5:? #6:NEXT I
201 ? #6;" ENTERNAMEOFFILE":? #6:?
#6:? #6
202 ? #6;" PRESS return ONLY":? #6;"  T
O RETURN TO MENU"
203 ? :INPUT FILE$
204 IF LEN(FILE$)=0 THEN GOTO MENU
206 IF ASC(FILE$(1,1))>64 AND ASC(FILE
$(1,1))<91 THEN 220
208 GRAPHICS 1:COLOR 1:POKE 752,1:? #6
:? #6
210 ? #6;"   FIRSTLETTER":? #6;"  OF
FILENAME":? #6;"  MUSTBEGINWITH":?
#6;"  A LETTER (A-Z)"
211 ? #6:? #6;" RE-ENTER FILE NAME"
212 ? :? :? "↖":?
214 GOTO 203
220 IF LEN(FILE$)<2 THEN 224
222 IF FILE$(1,2)="D:" THEN 225
223 IF FILE$(1,2)="C:" THEN 225
224 T$="D:":T$(3)=FILE$:FILE$=T$
225 RETURN
399 REM ***** PREPARE SKETCHPAD *****
400 GRAPHICS 5:COLOR 1:POKE 752,1
402 POKE 764,255
404 PLOT 53,33:DRAWTO 53,7:DRAWTO 27,7
:POSITION 27,32:POKE 765,3:XIO 18,#6,0
,0,"S:"
410 COLOR 1:PLOT 27,33:DRAWTO 53,33
420 COLOR 3
425 IF NOT CHOICE THEN GOTO INSTRUCT
430 IF NOT AGAIN OR (LEN(X$)=0) THEN
X$="":Y$="":X=12:Y=12:COLOR 2:PLOT X+2
8,Y+8:AGAIN=1:GOTO 450
440 COLOR 0
441 FOR J=1 TO LEN(X$)
442 GOSUB PLACE
444 PLOT X+28,Y+8
446 NEXT J
448 COLOR 2:PLOT X+28,Y+8:DRW=0
450 ? "ARROWSdraw       Start/Stop dr
awing":?
460 ? "Erase design     Quit drawing"
470 CLOSE #3:OPEN #3,4,0,"K:"
599 REM ***** USER CREATES DESIGN ***
600 GET #3,KEY:REM MOVE ROUTINE
601 IF PEEK(694)<>0 THEN POKE 694,0:GO
TO 600:REM DISABLE INVERSE VIDEO KEY
602 IF PEEK(702)=0 THEN POKE 702,64:GO
TO 600:REM DISABLE LOWER CAPS KEY
605 IF NOT DRW THEN COLOR 3:PLOT X+28
,Y+8
```

continued on next page



```
606 IF KEY=Q THEN GOTO CHECK
607 IF KEY=S AND NOT DRW THEN DRW=1:G
OTO 619
608 IF DRW AND KEY=S THEN DRW=0:COLOR
1:PLOT X+28,Y+8:X$(LEN(X$))="":Y$(LEN(
Y$))=""
610 IF KEY=E THEN AGAIN=0:GOTO SKETCHP
D
612 IF KEY=UP THEN Y=Y-1:IF Y<0 THEN Y
=24
614 IF KEY=DOWN THEN Y=Y+1:IF Y>24 THE
N Y=0
615 IF KEY=LEFT THEN X=X-1:IF X<0 THEN
 X=24
618 IF KEY=RIGHT THEN X=X+1:IF X>24 TH
EN X=0
619 IF DRW THEN X$(LEN(X$)+1)=CHR$(X):
Y$(LEN(Y$)+1)=CHR$(Y):COLOR 0:PLOT X+2
8,Y+8:GOTO MOVE
620 COLOR 2:PLOT X+28,Y+8
645 GOTO MOVE
649 REM ***** CHECK VALID DESIGN ****
650 IF LEN(X$)>1 THEN GOTO MENU
655 GRAPHICS 17:COLOR 1:POKE 764,255
660 FOR I=1 TO 5:? #6:NEXT I
665 ? #6;"   YOU DO NOT HAVE"
666 ? #6;"LARGE ENOUGH DESIGN"
667 ? #6;" TO MAKE A PATTERN"
668 ? #6:? #6:? #6;"  DO YOU WANT MORE
":? #6:? #6:? #6;"        (Y/N)"
670 GOSUB RESPONSE:IF KEY=89 THEN GOTO
 SKETCHPD
675 IF KEY<>78 THEN 670
680 AGAIN=0:DRW=0:GOTO MENU
699 REM ***** MAIN MENU ROUTINE *****
700 GRAPHICS 17:COLOR 1:POKE 752,1:POK
E 764,255:POP :REM MENU ROUTINE
705 ? #6;"  pattern  maker"
706 ? #6;" by frank roberts"
707 ? #6:? #6:? #6;" 0 INSTRUCTIONS"
708 ? #6:? #6;" 1 create/edit
  design"
709 ? #6:? #6;" 2 mirror  image"
710 ? #6:? #6;" 3 ink  blot"
711 ? #6:? #6;" 4 patterns"
712 ? #6:? #6;" 5 save  design"
713 ? #6:? #6;" 6 load  design"
714 ? #6:? #6;" 7 stop  program"
715 ? #6:? #6:? #6;"   YOUR CHOICE ?"
720 GOSUB RESPONSE:POKE 764,255
730 IF KEY<48 OR KEY>55 THEN 720
735 CHOICE=KEY-48
737 POKE 764,255
740 ON CHOICE+1 GOTO SKETCHPD,SKETCHPD
,MIRROR,BLOT,PATTERNS,FILE,FETCH,EXIT
799 REM ***** SET UP MODE FACTORS
800 FX=60:FY=20:GRAPHICS 7:GOTO 830
810 FX=60:FY=10:GRAPHICS 7:GOTO 830
820 FX=40:FY=10:GRAPHICS 8
830 DESIGN=0:ROW=0:POKE 752,1
840 IF LEN(X$)<2 THEN GOTO CHECK
850 ? "PRESS ESCAPE KEY TO STOP/START
DESIGN"
860 ? :REM COMMAND FOR SCREEN DUMP GOE
S HERE
890 ? "PRESS ANY OTHER KEY TO RETURN T
O MENU"
899 REM ***** DRAW PATTERNS FM DESIGN
900 SETCOLOR 2,0,0
902 FOR IMAGE=1 TO 4
907 IF CHOICE=2 AND IMAGE>2 THEN 965
908 IF IMAGE=3 THEN FY=FY+24
910 FOR J=1 TO LEN(X$)
920 GOSUB PLACE
930 GOSUB PLACE+IMAGE
935 IF PEEK(764)=28 THEN POKE 764,255:
GOSUB RESPONSE:IF KEY<>27 THEN GOTO ME
NU
940 REM
950 PLOT A,B
960 NEXT J
965 NEXT IMAGE
970 IF CHOICE<4 THEN GOSUB RESPONSE:GO
TO MENU
975 FX=FX+24:FY=FY-24:DESIGN=DESIGN+1:
IF DESIGN<10 THEN GOTO MAKE
977 FX=40:FY=FY+48:DESIGN=0:ROW=ROW+1:
IF ROW<3 THEN GOTO MAKE
980 GOSUB RESPONSE
990 GOTO MENU
999 REM ***** STORE DESIGN *****
1000 IF LEN(X$)=0 THEN GOTO MENU
1010 GOSUB NAMECHEK
1020 OPEN #1,8,0,FILE$
1100 PRINT #1;X$
1200 PRINT #1;Y$
1300 CLOSE #1
```

continued on page 46



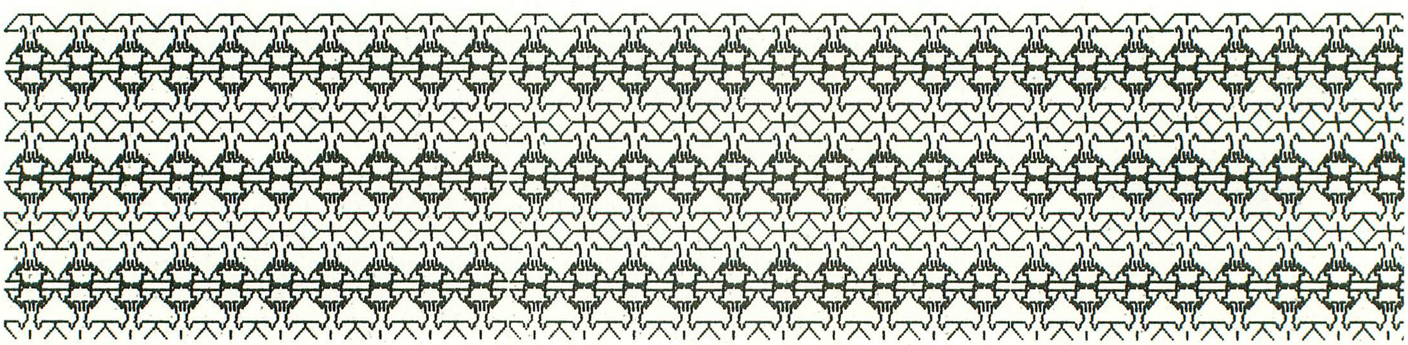
PATTERN MAKER *continued from page 44*

```
1310 GRAPHICS 1:COLOR 1:FOR I=1 TO 5:?
 #6:NEXT I
1320 ?#6;FILE$;"  IS FILED":?#6:?#6:
? #6;"  PRESS ANY KEY "
1330 GOSUB RESPONSE:GOTO MENU
1999 REM ***** FETCH DESIGN *****
2000 GRAPHICS 1:COLOR 1:POKE 752,1:POK
E 764,255
2010 X$="":Y$=""
2020 GOSUB NAMECHEK
2030 TRAP FILERROR
2040 OPEN #1,4,0,FILE$
2050 TRAP 2080
2060 INPUT #1,X$
2070 INPUT #1,Y$
2080 CLOSE #1
2090 AGAIN=1:GOTO MENU
2499 REM ***** FILE NOT FOUND ERROR *
2500 GRAPHICS 1:COLOR 1:POKE 752,1:POK
E 764,255:REM CHECK FOR NO FILE FOUND
2510 FOR I=1 TO 5:? #6:NEXT I
2520 ? #6;"   FILE NOT FOUND"
2530 ? #6:? #6;" DO YOU WANT TO SEE"
2540 ? #6;"    DISK DIRECTORY ?"
2550 ? #6:? #6;"            (Y/N)"
2560 GOSUB RESPONSE
2570 IF KEY<>YES THEN GOTO MENU
2580 GRAPHICS 0:POKE 752,1:POKE 764,25
5
2590 CLOSE #1:OPEN #1,6,0,"D:*.*"
2600 TRAP 2700
2610 INPUT #1,X$
2620 ? X$
2630 AGAIN=0:GOTO 2610
2700 CLOSE #1
2710 ? :? "DO YOU WANT TO TRY AGAIN ?
(Y/N)"
2720 GOSUB RESPONSE
2730 IF KEY=YES THEN GOTO FETCH
2740 AGAIN=0:GOTO MENU
2999 REM ***** GET INSTRUCTIONS *****
3000 POKE 764,255:POKE 752,1
3001 ? "When you choose option 1 you w
ill":? "see a sketch pad like the one
above."
3002 ? "(PRESS ANY KEY FOR MORE INSTRU
CTIONS)"
3003 GOSUB RESPONSE:GRAPHICS 0:POKE 75
2,1
3004 ? "Use the keyboard arrow keys to
 plot":? "a design on the sketch pad."
3005 ? "All black lines or points draw
n on":? "the pad will be stored in mem
ory"
3007 ? "to be transformed into designs
 ":?:? "Any line or point color other
 than"
3008 ? "black will not be plotted.":?
"You may change the color at any time"
3009 ? "by pressing the 'S' key. "
3010 ?:? "Pressing 'E' will erase you
r design":? "so that you may start aga
in"
3012 ?:? "When you have the design yo
u want,"
3013 ? "press the 'Q' key and the prog
ram":? "will return you to the menu "
3014 ? "--from which you may select ot
her":? "options."
3015 ?:?:? "PRESS ESCAPE KEY TO RETU
RN TO MENU":? "ANY OTHER KEY REPEATS I
NSTRUCTIONS"
3018 GOSUB RESPONSE:IF KEY=27 THEN AGA
IN=0:GOTO MENU
3020 GRAPHICS 0:POKE 752,1:GOTO INSTRU
CT+4
3999 REM ***** TERMINATE PROGRAM ****
4000 GRAPHICS 0:CLR :END
```

TYPO TABLE

Variable checksum = 2099925

Line num		range	Code	Length
10	-	55	PW	346
58	-	80	PU	382
82	-	107	LI	464
108	-	208	OY	534
210	-	402	QT	436
404	-	450	CX	488
460	-	610	DR	500
612	-	665	MD	489
666	-	708	FB	545
709	-	740	JP	430
799	-	902	JM	448
907	-	975	BK	273
977	-	1320	UA	360
1330	-	2090	NC	241
2499	-	2600	FG	445
2610	-	3002	EX	344
3003	-	3012	JE	501
3013	-	4000	PE	346



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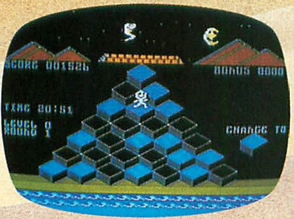


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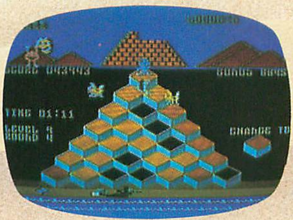


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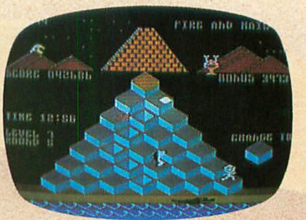
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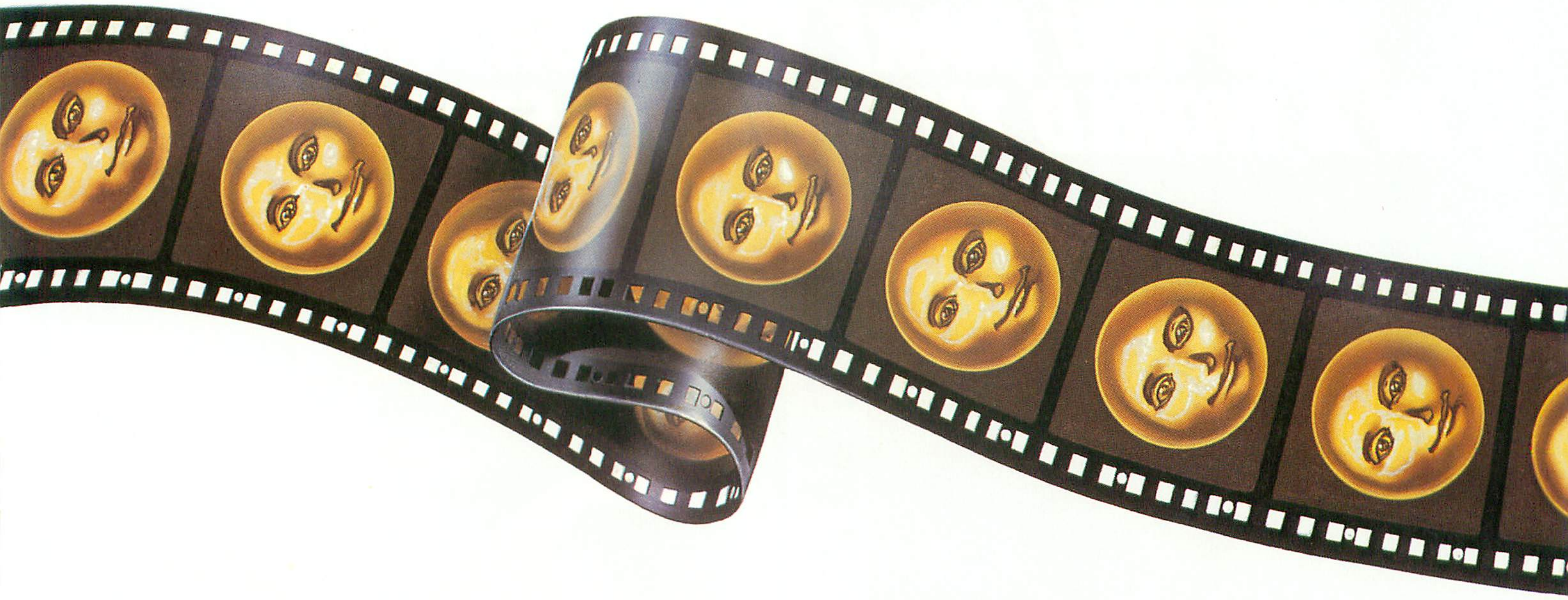
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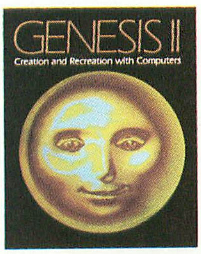
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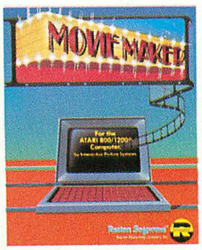
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FANTASY ROLLS

by BOB ALBRECHT and GEORGE FIREDRAKE

FANTASY ROLE PLAYING GAMES

Millions of people are playing fantasy role playing games. A role playing game is a game in which one or more players create and control characters (adventurers) who live their imaginary lives in a specially made game world. The game world is created, managed, and operated by a Game Master, also called a referee, adventure master, or dungeon master. For general information about role playing games try this excellent book:

Through Dungeons Deep by Robert Plamondon. From Reston Publishing Company, 11400 Sunset Hills Road, Reston, VA 22090.

Most people who play role playing games use a formal rule system. Some of the best known are listed below.

Dungeons & Dragons (D&D) from TSR Hobbies, P.O. Box 756, Lake Geneva, WI 53147.

RuneQuest (RQ) and *Worlds of Wonder* (WOW) from Chaosium, P.O. Box 6302, Albany, CA 94706.

Tunnels & Trolls (T&T) from Blade, Box 1467, Scottsdale, AZ 85252.

Beginners beware! The rule books are difficult to understand. We suggest you begin with *Tunnels & Trolls* or *Worlds of Wonder*. We will use *Worlds of Wonder* as the rule system in DragonSmoke. Even so, we suggest you get *Tunnels & Trolls* as an easy to understand introduction to games such as *Dungeons & Dragons*.

THE NAME MACHINE

Suppose you have just created a character to play in a fantasy role playing game. Will you name her Mary or Jane or Kate? Would you call him Bill or Joe or Tom? Probably not. Instead, you might use a name from fantasy literature or invent an unusual name.

Here is a program that invents five-letter names and prints them on the screen. Each name consists of a consonant, vowel, consonant, vowel, consonant — all picked at random. Thus, *possible* names include ROKAN, BARAK, NINOS, KAREN, MABEL, even CONAN.

```
100 REM**RANDOM NAMES
110 DIM   NAME$(20), C$(21), RC$(1)
120 DIM   V$(6), RV$(1)

300 REM**MAKE & PRINT NAMES
310 PRINT CHR$(125);
320 FOR K=1 TO 80
330    GOSUB 610
340    PRINT NAME$,
350 NEXT K

500 REM**TELL HOW TO DO AGAIN
510 PRINT
520 PRINT "TO DO AGAIN, PRESS SPACE"
530 OPEN #1, 4, 0, "K:"
540 GET #1, KEY
550 IF KEY <> ASC(" ") THEN 540
560 CLOSE #1
570 GOTO 310

600 REM**MAKE A NAME SUBROUTINE
610 NAME$ = ""
620 GOSUB 810
630 GOSUB 910
640 GOSUB 810
650 GOSUB 910
660 GOSUB 810
670 RETURN

800 REM**ADD A CONSONANT SUBROUTINE
810 C$ = "BCDFGHJKLMNPQRSTVWXYZ"
820 RC = INT(21*RND(0)) + 1
830 RC$ = C$(RC, RC)
840 NAME$(LEN(NAME$)+1) = RC$
850 RETURN
```

continued on next page

```
900 REM**ADD A VOWEL SUBROUTINE
910 V$ = "AEIOUY"
920 RV = INT(6*RND(0)) + 1
930 RV$ = V$(RV, RV)
940 NAME$(LEN(NAME$)+1) = RV$
950 RETURN
```

Run the program and write down any names you like. Sometimes you can change a masculine sounding name to a feminine sounding name by adding a vowel at the end. For example: ROKAN and ROKANA.

This program creates names of the form CVCVC (consonant, vowel, consonant, vowel, consonant). Modify the program to get names with a different structure.

- CCVCV For example: FRODO, THENA, STOKI
- VCCVCC For example: ELROND, ARGILF, OTTAMZ
- and so on — pick your own structure.

Better yet, let the user decide on the structure.

```
NAME STRUCTURE? CVCVC

FOR MORE NAMES,
  PRESS SPACE
FOR NEW STRUCTURE,
  PRESS 'S'
```

We suggest you print *two* names per line in this program

GAMEMASTER'S DICE

Here they are again, those funny dice, beloved of fantasy game people.

Last time, we challenged you to write a program to roll N dice, each with S sides. In game jargon: NDS. Here is our first program a piece at a time. We begin with blocks 100 and 300.

```
100 REM**GAMEMASTER'S DICE
110 DIM  D$(20), X$(1), S$(1)
120 PRINT CHR$(125);

300 REM**ASK WHAT TO ROLL (D$)
310 PRINT: PRINT "YOUR ROLL";
320 INPUT D$
330 IF LEN(D$)=0 THEN 310
```

We expect someone will type something recognizable such as 3D6 or DD or P or D12. Whatever she or he enters is assigned to the string variable D$ in line 320.

Let's take care of the easy stuff — P for a *percentile roll* (0 to 99) and DD for a *digit roll* (0 to 9).

```
400 REM**PERCENTILE ROLL
410 IF D$ <> "P" THEN 510
420 ROLL = INT(100*RND(0))
430 PRINT ROLL: GOTO 310

500 REM**DIGIT DIE ROLL
510 IF D$ <> "DD" THEN 610
520 ROLL = INT(10*RND(0))
530 PRINT ROLL: GOTO 310
```

Well, if you don't enter 'P' or 'DD', we assume you want 3D6 or 2D12 or D8 or some other combination of N dice, each with S sides. Remember, 3D6 means *three* dice, each with *six* sides. D8 means *one* die with *eight* sides. 1D8 also means *one* die with *eight* sides.

The letter 'D' is between the number of dice and the number of sides on each die. So, let's find the position of 'D' in the string D$. Call the position PD (Position of D).

```
600 REM**FIND 'D' in D$
610 FOR PD= TO LEN (D$)                 Didn't find 'D'.
620    X$ = D$(PD,PD)
630    IF X$="D" THEN 710
640 NEXT PD
650 PRINT "I DON'T UNDERSTAND"
660 GO TO 310
```

If D$ is 3D6, the PD is 2. Of course: D is the second character in 3D6.

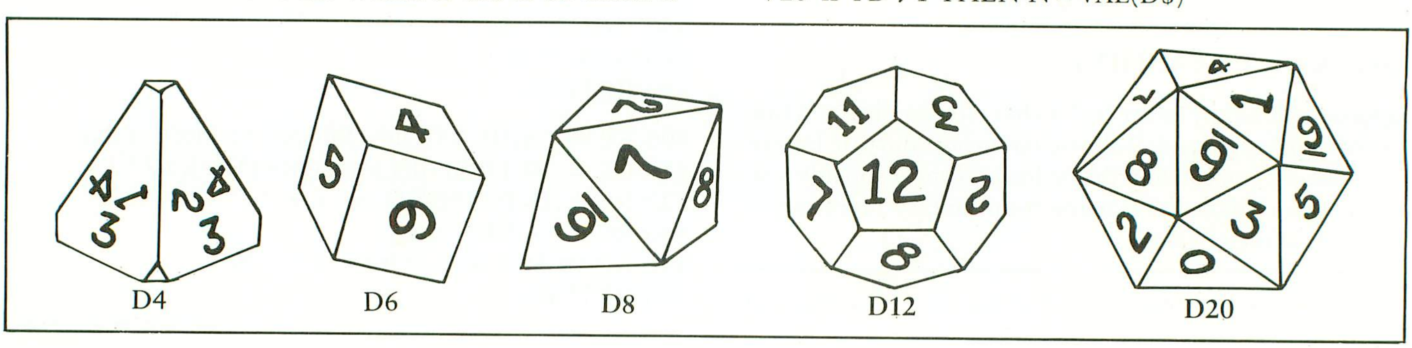


If D$ is D8, then PD is 1.

If D$ is 10D12, the PD is 3.

Having found where 'D' resides in D$, we move on. Next, we want to find N, the number of dice to "roll."

```
700 REM**NUMBER OF DICE, N
710 IF PD=1 THEN N=1
720 IF PD >1 THEN N=VAL(D$)
```



Aha! If 'D' is the first character of D$, we know someone wants the computer to roll *one* die. If 'D' is not the first character, we assume someone has specified how many dice to roll, as in 3D6, 2D7, or 1D12.

Now we want to find the number of sides (S) for each die. This, of course, is to the right of 'D'.

```
800 REM**NUMBER OF SIDES
810 LD = LEN(D$)
820 S$ = D$(PD + , LD)
830 S = VAL (S$)
```

Here are some examples.

D$	PD	PD + 1	LD	S$	S
3D6	2	3	3	"6"	6
2D8	2	3	3	"8"	8
D6	1	2	2	"6"	6
10D6	3	4	4	"6"	6
D12	1	2	3	"12"	12
1D12	2	3	4	"12"	12
10D12	3	4	5	"12'	12

The time has come to roll the dice, print the result, and go back for another request, ready to roll again.

```
900 REM**ROLLS NDS DICE
910 ROLL = 0
920 IF N=0 THEN 1010
930 IF S=0 THEN 1010
940 FOR KK=1 TO N
950    DIE = INT(S*RND(0))+1
960    ROLL = ROLL + DIE
970 NEXT KK

1000 REM**PRINT ROLL & GO BACK
1010 PRINT ROLL
1020 GOTO 310
```

There is always another way. We will return to this problem and explore other ways to do it. In the meantime, your turn.

- ► You can fool this program. Do it! Make a list of all the ways you fooled it, then try to make the program smarter.
- ► Add block 200 to tell the user what to do.
- ► In block 100, add REM statements to briefly describe the variables in the program.
- ► Write a very different program to do the same thing.

A SMALL CAST OF CHARACTERS

We have just finished writing, with Greg Stafford of Chaosium, a book called *Adventurer's Handbook: A Beginner's Guide to Role Playing Games*. It will be published in late 1983 by Reston Publishing Company. Below are some of the characters who appear in *Adventurer's Handbook*.

	STR	CON	SIZ	INT	POW	DEX	CHA
Aloysious	10	11	10	12	10	12	9
Barostan	17	17	13	8	7	15	6
Bridla	11	12	10	15	6	11	16
Dernfara	13	13	8	13	4	17	6
Joleen	13	11	7	13	8	17	13
Rokana	9	9	9	17	18	9	10

Let's store this information in DATA statements, as follows.

```
30000 REM**DATA FILE
30010 DATA ALOYSIOUS
30011 DATA 10, 11, 10, 12, 10, 12, 9
30020 DATA BAROSTAN
30021 DATA 17, 17, 13, 8, 7, 15, 6
30030 DATA BRIDLA
30031 DATA 11, 12, 10, 15, 6, 11, 16
30040 DATA DERNFARA
30041 DATA 13, 13, 8, 13, 4, 17, 6
30050 DATA JOLEEN
30051 DATA 13, 11, 7, 13, 8, 17, 13
30060 DATA ROKANA
30061 DATA 9, 9, 9, 17, 18, 9, 10
30070 DATA ENDFILE
30071 DATA 0, 0, 0, 0, 0, 0, 0
```

Lines 30000 through 30071 comprise a *data file*. This file consists of eight *records*. Each record consists of a name followed by seven numbers. For instance:

Name

```
30010 DATA ALOYSIOUS
30011 DATA 10, 11, 10, 12, 10, 12, 9
```

Seven numbers

The last record, which begins with ENDFILE, is not an actual character record. Instead, it simply marks the end of the file.

We challenge you to write two programs to use this *data file, data base*, or whatever you want to call it.

Program #1 begins at line 1000. If you type the name of a character, the computer finds the appropriate information and displays it on the screen. If you enter a name that is not in the file, the computer searches in vain and eventually finds ENDFILE. It then prints I DON'T KNOW followed by the name you entered. This also happens if you misspell a name that is in the file.

```
NAME OF CHARACTER?
```

Enter BRIDLA and press RETURN

```
NAME OF CHARACTER? BRIDLA
```

continued on next page

STR 11
CON 12
SIZ 10
INT 15
POW 6
DEX 11
CHA 16

TO DO AGAIN, PRESS SPACE

Program #2 scans the entire file, beginning with the first record. To get the next record, press the space bar. If the computer is already displaying the last record (ENDFILE) and your press the space bar, it begins over with the first record.

In this part of DragonSmoke we will explore the use of your friendly ATARI computer to help you store, manage, and use information. We begin with data files stored in DATA statements as part of the program. Is anyone out there interested in easy stuff for beginners about cassette files and disk files?

POSITIVE, NEGATIVE, OR ZERO

A simple program: write a program that tells whether a number is positive, negative, or zero. Last time, we showed three ways to do it, and challenged you to complete the program for METHOD #4. Here is our program.

METHOD #4

```
100 REM**POSITIVE, NEGATIVE, OR ZERO
110 DIM YN$(15), NZP$(24)
120 YN$ = "YOUR NUMBER IS "
130 NZP$ = "NEGATIVEZERO    POSITIVE"

200 REM**TELL WHAT TO DO
210 PRINT CHR$(125)
220 PRINT "ENTER A NUMBER AND I'LL TELL"
230 PRINT "YOU WHETHER YOUR NUMBER IS"
240 PRINT "POSITIVE, NEGATIVE, OR ZERO."

300 REM**ASK FOR NUMBER
310 PRINT
320 PRINT "YOUR NUMBER";: INPUT X

400 REM**TELL ABOUT NUMBER
410 W = SGN(X) + 1
420 PRINT YN$; NZP$(8*W+1, 8*W+8)

500 REM**GO FOR ANOTHER NUMBER
510 GOTO 310
```

Line 130 contains the words NEGATIVE, ZERO, and POSITIVE. We added four spaces to the right of ZERO so each *substring* has exactly eight characters.

"NEGATIVEZERO   POSITIVE"

8 characters

NEGATIVE is in character positions 1 to 8.
ZERO and four space occupies positions 9 to 16.
POSITIVE resides in positions 17 to 24.

Here is a handy table to help you understand lines 410 and 420.

X	W	8*W+1	8*W+8	NZP$(8*W+1,8*W+8)
<0	0	1	8	NEGATIVE
=0	1	9	16	ZERO and 4 spaces
>0	2	17	24	POSITIVE

We also asked you to do METHOD #5, with block 100 changed as follows.

```
100 REM**POSITIVE, NEGATIVE, OR ZERO
110 DIM YN$(15), NZP$(8)
120 YN$ = "YOUR NUMBER IS "
130 DATA NEGATIVE
140 DATA ZERO
150 DATA POSITIVE
```

Here are two ways. We call 'em METHODS 5 and 6.

METHOD #5

```
400 REM**TELL ABOUT NUMBER
410 W = SGN(X) +2                W is 1, 2, or 3
420 RESTORE
430 FOR K=1 TO W
440    READ NZP$
450 NEXT K
460 PRINT YN$;    NZP$
```

METHOD #6

```
400 REM**TELL ABOUT NUMBER
410 W = SGN(X) + 1
420 RESTORE 130 + 10*W
430 READ NZP$
440 PRINT YN$;    NZP$
```

Both methods depend on the SGN function, a curious sort of beast. It behaves like this.

If X is negative, sign(X) is –1.
If X is zero, SGN(X) is 0.
If X is positive, SGN(X) is 1.

SGN is always –1, 0, or 1.

Here is another handy table to help you understand lines 410, 420, and 430 in METHOD #6.

X	W	RESTORE 130 + 10*W	NZP$
<0	0	RESTORE 130	NEGATIVE
=0	1	RESTORE 140	ZERO
>0	2	RESTORE 150	POSITIVE

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Kidnapped in revenge and locked in hatred somewhere deep beneath your castle, is your princess.

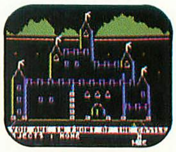
Gwendolyn.

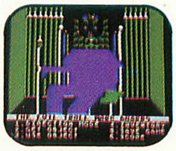
The prosperity of your kingdom, the end of a bitter feud, your very future depend on finding her.

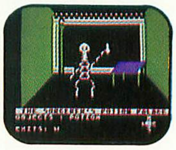
You swear that no obstacle can stop you. But the high-resolution, 3-D graphics, animation and sound effects make the obstacles that await you more formidable than you can imagine.

And with over ninety different screens and two full sides of play, those obstacles and the decisions you must make can appear endless. In fact, you may have to endure hours of searching to rescue Gwendolyn.

But for her, you would endure anything, wouldn't you?







These are just three of over ninety exciting screens.

Gwendolyn—a non-violent, intermediate graphic adventure game, written by Marc Russell Benioff, Atari 40K Disk $27.95, Artworx Software Co., Inc., 150 N. Main St., Fairport, N.Y. 14450. For a free catalog of Artworx Software for the Atari, Apple, VIC-20 & Commodore 64 computers, write or call 800-828-6573.

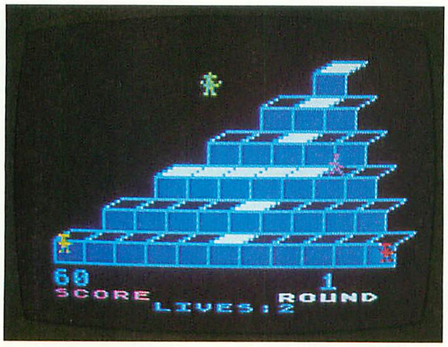
Artworx®

So you can play.

HOOKEY!

by DAVID PLOTKIN

Playing hookey from school is not such a good idea unless you want to be unemployed. But playing HOOKEY!, the game in this month's ANTIC, is an acceptable alternative.



How do you play HOOKEY!? First, type it into your computer and SAVE a copy before running it. Then run TYPO on it and fix any mistakes in your typing. Plug a joystick into Port One and you are ready.

You control a kid who decided to play on the local rock pile today instead of going to school. Guide the kid from stone to stone, turning each square from dark to light as he lands on it.

The joystick only responds to four directions: left, right, up and down. The play mechanics get are a little unusual, but you'll get used to them. You get a bonus for stepping on every stone then the pile is redrawn and it all starts over. You get ten points for each square completed and a thousand points for completing the whole rock pile. You start with three lives and get a new one at each thousand points you earn. Using all your lives ends the game.

Sounds easy, right? Come on folks, have you ever known me to write an easy game? First of all, you'd better stay on the pile! Hopping into empty space or stepping off the edge of the rock pile results in a loss of life when you fall off the screen. Next, three truant officers are determined to put you back in school. They will converge on you, and they get smarter and faster with each round. If one touches you, you lose one life and have to start over at the top of the pile again. If they catch you when you have only one life left, then off you go to *reform school*, and the game is over.

By the way, due to the slowness of BASIC, the score and "lives" displayed on the screen are only updated when you are captured, fall off the rocks, or light all the squares. The program does know what these quantities are, however, so don't worry.

```
1 REM **HOOKEY BY DAVID PLOTKIN ** ANTIC MAGAZINE **
10 GOSUB 800:GRAPHICS 7:POKE 708,136:POKE 709,130:POKE 559,46:POKE 53277,3:SCORE=0:ROUND=1:LIVES=3:GOSUB 1000
12 GOSUB 1090
20 GOTO 100
30 SOUND 0,XP0,10,4:CX=XP0-46:CY=YP0+9:COLOR 3:PLOT CX,CY:DRAWTO CX+10,CY:PLOT CX-2,CY+1:DRAWTO CX+8,CY+1
40 PLOT CX-4,CY+2:DRAWTO CX+6,CY+2:NUMBLOCK=NUMBLOCK+1:SCORE=SCORE+10
50 IF SCORE/1000=INT(SCORE/1000) THEN LIVES=LIVES+1
60 IF NUMBLOCK=36 THEN POP :GOTO 500
70 SOUND 0,0,0,0:RETURN
100 ST=PEEK(632):XP0=XP0+12*(ST=7)-12*(ST=11)+8*(ST=14)-8*(ST=13):YP0=YP0+12*(ST=13)-12*(ST=14):POKE 77,0
110 IF ST=11 OR ST=7 THEN SHAPE=PM1*(ST=11)+PM2*(ST=7)
120 POKE 53248,XP0:D=USR(ADR(JUMP$),PM0+YP0,SHAPE):POKE 53278,0
130 FOR N=1 TO 3:RR=PEEK(53770)/ROUND:VEL1=VEL*(XP(N)<XP0)*(RR<26)-VEL*(XP(N)>XP0)*(RR<26)
140 VEL2=VEL*(YP(N)<YP0)*(RR<26)-VEL*(YP(N)>YP0)*(RR<26):XP(N)=XP(N)+VEL1:YP(N)=YP(N)+VEL2
150 D=USR(ADR(JUMP$),PM(N)+YP(N),PM3):POKE 53248+N,XP(N):NEXT N
160 IF PEEK(53260)<>0 THEN GOTO 300:REM CAPTURED!
170 IF PEEK(53252)=0 OR YP0=70 THEN GOTO 400:REM FELL OFF!
180 IF PEEK(53252)<5 THEN GOSUB 30:REM COLOR IN THE SQUARE
```

continued on page 59


John Anderson's
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HOOKY *continued from page 57*

```
190 GOTO 100
300 SOUND 0,66,10,4:GOSUB 390:GOSUB 39
0:SOUND 0,60,10,4:GOSUB 390:SOUND 0,56
,10,4:GOSUB 390
310 SOUND 0,66,10,4:GOSUB 390:SOUND 0,
0,0,0
320 FOR N=10 TO 100:POKE 704,N:SOUND 0
,N,10,4:NEXT N:POKE 704,N:SOUND 0,0,0,
0
330 LIVES=LIVES-1
340 D=USR(ADR(JUMP$),PM0+YP0,PMB+100)
350 FOR N=1 TO 3:D=USR(ADR(JUMP$),PM(N
)+YP(N),PMB+100):NEXT N:POKE 53278,1

360 IF LIVES=0 THEN GOTO 600
370 GOSUB 960:GOSUB 1120:GOTO 100
390 FOR N=1 TO 100:NEXT N:RETURN
400 FOR N=YP0+2 TO 100:POKE 704,N:SOUN
D 0,N,10,4:FOR Q=1 TO 10:NEXT Q
410 D=USR(ADR(JUMP$),PM0+N,PM1):NEXT N
:SOUND 0,0,0,0:YP0=N-1:GOTO 330
500 SOUND 0,60,10,4:GOSUB 390:SOUND 0,
54,10,4:GOSUB 390:SOUND 0,48,10,4:GOSU
B 390:SOUND 0,40,10,4:GOSUB 390
510 SOUND 0,54,10,4:GOSUB 390:SOUND 0,
40,10,4:GOSUB 390:SOUND 0,0,0,0
520 ? #6;CHR$(125):D=USR(ADR(JUMP$),PM
0+YP0,PMB+100):FOR N=1 TO 3:D=USR(ADR(
JUMP$),PM(N)+YP(N),PMB+100):NEXT N
530 ROUND=ROUND+1:VEL=VEL+(VEL<3):GOSU
B 1000:SOUND 1,0,0,0
540 SCORE=SCORE+1000:NUMBLOCK=0
550 GOTO 340
600 REM
630 ?CHR$(125):POKE 656,0:POKE 657,0:
? "GAME OVER":POKE 656,0:POKE 657,20:?
 "SCORE ";SCORE
640 POKE 656,1:POKE 657,0:? "PRESS fir
e to PLAY"
650 IF STRIG(0)=1 THEN 650
660 ? #6;CHR$(125):ROUND=1:VEL=1:SCORE
=0:NUMBLOCK=0:LIVES=3:SHAPE=PM1
670 GOSUB 1000:SOUND 1,0,0,0:GOTO 340
800 GRAPHICS 3:POKE 710,0:COLOR 1
810 PLOT 0,0:DRAWTO 0,10:PLOT 5,0:DRAW
TO 5,10:PLOT 0,5:DRAWTO 5,5
820 PLOT 7,3:DRAWTO 7,7:DRAWTO 9,10:DR
AWTO 11,10:DRAWTO 13,7:DRAWTO 13,3:DRA
WTO 11,0:DRAWTO 9,0:DRAWTO 7,3
```

continued on next page

```
830 PLOT 15,3:DRAWTO 15,7:DRAWTO 17,10
:DRAWTO 19,10:DRAWTO 21,7:DRAWTO 21,3:
DRAWTO 19,0:DRAWTO 17,0:DRAWTO 15,3
840 PLOT 23,0:DRAWTO 23,10:PLOT 23,5:D
RAWTO 27,0:PLOT 23,5:DRAWTO 27,10
850 PLOT 29,0:DRAWTO 29,10:PLOT 29,0:D
RAWTO 31,0:PLOT 29,5:DRAWTO 31,5:PLOT
29,10:DRAWTO 31,10
860 PLOT 33,0:DRAWTO 36,3:DRAWTO 39,0:
PLOT 36,3:DRAWTO 36,10
870 POKE 752,1:PRINT "GAME BY DAVID PL
OTKIN":PRINT "CONCEPT BY ROBERT DEWITT
"
880 PMB=PEEK(106)-24:POKE 54279,PMB:PM
B=PMB*256:POKE 623,1
890 POKE 704,4:POKE 705,22:POKE 706,20
0:POKE 707,50:DIM JUMP$(26),PM(4),XP(4
),YP(4)
900 FOR J=1 TO 25:READ AA:JUMP$(J,J)=C
HR$(AA):NEXT J
910 DATA 104,104,133,204,104,133,203,1
04,133,207,104,133,206,160,0,177,206,1
45,203,200,192,50,208,247,96
920 FOR N=0 TO 500:SOUND 0,N,10,4:SOUN
D 1,500-N,10,4:NEXT N:POKE 88,0:POKE 8
9,PEEK(106)-24:PRINT #6;CHR$(125)
925 SOUND 0,0,0,0:SOUND 1,0,0,0
930 FOR LOOP=2 TO 8 STEP 3:FOR J=0 TO
7:READ AA:POKE PMB+LOOP*10+J,AA:NEXT J
:NEXT LOOP
939 REM BOY FACING LEFT STARTS AT PMB+
20
940 DATA 28,28,8,29,110,12,55,97
944 REM BOY FACING RIGHT STARTS AT PMB
+50
945 DATA 28,28,72,124,15,28,118,67
949 REM TRUANT OFFICER STARTS AT PMB+8
0
950 DATA 16,124,48,185,126,56,40,108
960 FOR N=1 TO 3:PM(N)=PMB+512+128*N:Y
P(N)=-8+82*(N=1 OR N=3):NEXT N:XP(1)=5
5:XP(2)=125:XP(3)=200
970 PM0=PMB+512:XP0=170:YP0=-2:PM1=PMB
:PM2=PMB+30:PM3=PMB+60
990 RETURN
1000 COLOR 1:X=145:Y=-6:N=-2
1010 FOR M=1 TO 6
1020 N=N+2:X=X-20:Y=Y+12
1030 FOR Q=0 TO N
1040 XX=X+Q*12
1050 PLOT XX,Y:DRAWTO XX+12,Y:DRAWTO X
X+4,Y+4:DRAWTO XX-8,Y+4:DRAWTO XX,Y:PL
OT XX+4,Y+4:DRAWTO XX+4,Y+12
1060 PLOT XX-8,Y+4:DRAWTO XX-8,Y+12
1070 SOUND 1,XX,10,4:COLOR 2
1080 FOR YY=Y+5 TO Y+11:PLOT XX-7,YY:D
RAWTO XX+3,YY:NEXT YY:COLOR 1:NEXT Q:N
EXT M:PLOT 17,78:DRAWTO 149,78
1085 RETURN
1090 SOUND 1,0,0,0:DL=PEEK(560)+256*PE
EK(561):NUMBLOCK=0:SHAPE=PM1:BOARD=1:V
EL=1
1100 A=DL+85
1110 POKE A,71:POKE A+3,6:POKE A+4,6:P
OKE A+5,65:POKE A+6,PEEK(A+7):POKE A+7
,PEEK(A+8):POKE 710,12
1120 POKE 656,0:POKE 657,22:PRINT "sco
re      ROUND"
1130 POKE 656,0:POKE 657,2:PRINT SCORE
;:POKE 657,15:PRINT ROUND;
1140 POKE 656,1:POKE 657,7:? "LIVES:";
LIVES;:D=USR(ADR(JUMP$),PM0+YP0,PM1):P
OKE 53248,XP0
1150 FOR Q=1 TO 3:D=USR(ADR(JUMP$),PM(
Q)+YP(Q),PM3):POKE 53248+Q,XP(Q):NEXT
Q:RETURN
```

TYPO TABLE

Variable checksum = 1124097

Line num		range	Code	Length
1	-	70	WC	538
100	-	160	JI	541
170	-	340	TQ	510
350	-	500	BK	516
510	-	640	VQ	536
650	-	830	FG	662
840	-	890	LJ	618
900	-	940	JO	525
944	-	1020	YT	504
1030	-	1110	HG	633
1120	-	1150	LR	281

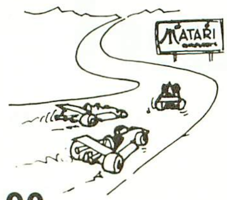
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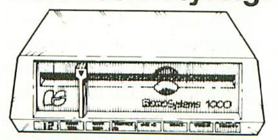
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ARTISTRY IN ELECTRONIC GAMING

The "star" system pays off

by DAVID DUBERMAN

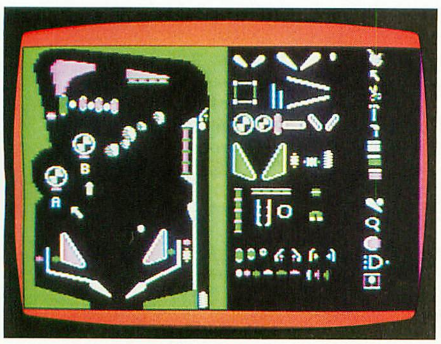
Electronic Arts, a visionary new company in San Mateo, California, has introduced a line of software that could quite possibly change the history of computer gaming. **Archon, Murder on the Zinderneuf, Pinball Construction Set, M.U.L.E.**, and **WORMS?** are five of the most original and innovative programs that have been produced under the heading of entertainment for any home computer. Indeed, they could be the forerunners of future software that will be *more* than entertainment.

Electronic Arts is deliberately emulating the music recording industry in producing and marketing its computer software. It is building a "star" system of programmers for whom the best development tools and supporting staff will be provided. Even the packaging is similar. Each game comes in its own handsome, three-panel, cardboard jacket. Everything about these programs attests to thorough professionalism.

Archon was created by Freefall Associates, namely Anne Westfall, John Freeman, and Paul Reiche III. This highly original and tremendously exciting game of strategy *and* reflexes pits the forces of Light against the forces of Darkness. The game bears a superficial resemblance to chess, but it is very different. At the game's start, the forces of Light are lined up opposite the forces of Darkness, each taking one side of the 9 × 9 board. Each force has a primary piece, or icon; the Wizard for the Light side and the Sorceress for the Dark. Supporting these are such lesser icons as Unicorns, a Djinni, a Phoenix, a dragon, trolls and banshees. Turns alternate, each side either moving a piece or using its primary icon to cast a spell. Spells include the power to revive a captured icon or teleport icons to anyplace on the board. The object is to either occupy all of the five designated power squares, or to eliminate the opposing side. You may control either side against the computer or a friend, or you can watch the computer play a rip-roaring game against itself.

continued on page 67

Pinball Construction Set



Murder on the Zinderneuf



Archon



We just made owning an Atari computer a lot more logical.



Introducing the Rana 1000 disk drive. It's a whole new game for Atari computers.



This two digit LED readout displays a code that tells you everything you need to know.

This beeping button tells you your write protect feature is keeping your information safe.

The remaining buttons beep when touched, and provide readouts on density storage, error status, and drive number.

This button beeps when you touch it, and the LED readout tells you what track you're on.

When Rana Systems introduced the Elite Series of Apple® compatible disk drives, we didn't know what a tremendous impact they would make. It turned out to be a line so outstanding in performance, styling, capacity, and price, that it instantaneously made us a major force in the market. Well, needless to say, the response was so great that we were forced to create the same highly advanced disk drive for Atari.® A disk drive that when coupled with Atari's computer, could perform everything from accounting, financial planning, and stock charting, to word processing, business management, and letting you write your own programs. Plus, we made it simple enough for a child to use, for learning anything from the alphabet to a foreign language.

Working with a diskette versus playing with a cassette.

Let's face it. The only reason Atari made a cassette option to their computer was to make it affordable. But now you don't have to settle for less. Because now you can get a diskette for your Atari computer which outperforms their cassette and costs ⅓ less than their disk drive. With Atari's cassette you only get half the functions of a computer compared to what our floppy disk can give you. Their cassette is not only limited in the software available, but it also takes 20 times longer to get the information you need. And Rana's disk drive offers twice the storage capacity of either their cassette or disk drive.

Why even stylewise our new low profile design not only looks 100 times more spectacular, but it occupies 3 times less space. And our new Rana 1000 also gives you a piece of its mind every time you use it, because our disk drive gives you information as well as takes it. And we think that says a lot.

The disk drive that has all the answers.

Rana offers you a myriad of features Atari couldn't even conceive of. Like five electronic functions on the front panel that actually beep and give you a LED readout when touched. Our disk drive tells you what track you're on, and what density and how much information you're storing. It lets you switch from a single density of 90,000 letters to a double density of 180,000 letters, on a single diskette. And, we have a write protect feature which protects your diskette from being erased. In fact, no other disk drive can offer you that.

As you can see, it was easy to build a disk drive superior to Atari's. Because for every reason you buy a disk drive, Rana has superior technology.

The Rana 1000 disk drive. It brings your Atari computer to a higher level of sophistication for a price one third lower than Atari's. So your choice shouldn't even be a matter of logic.

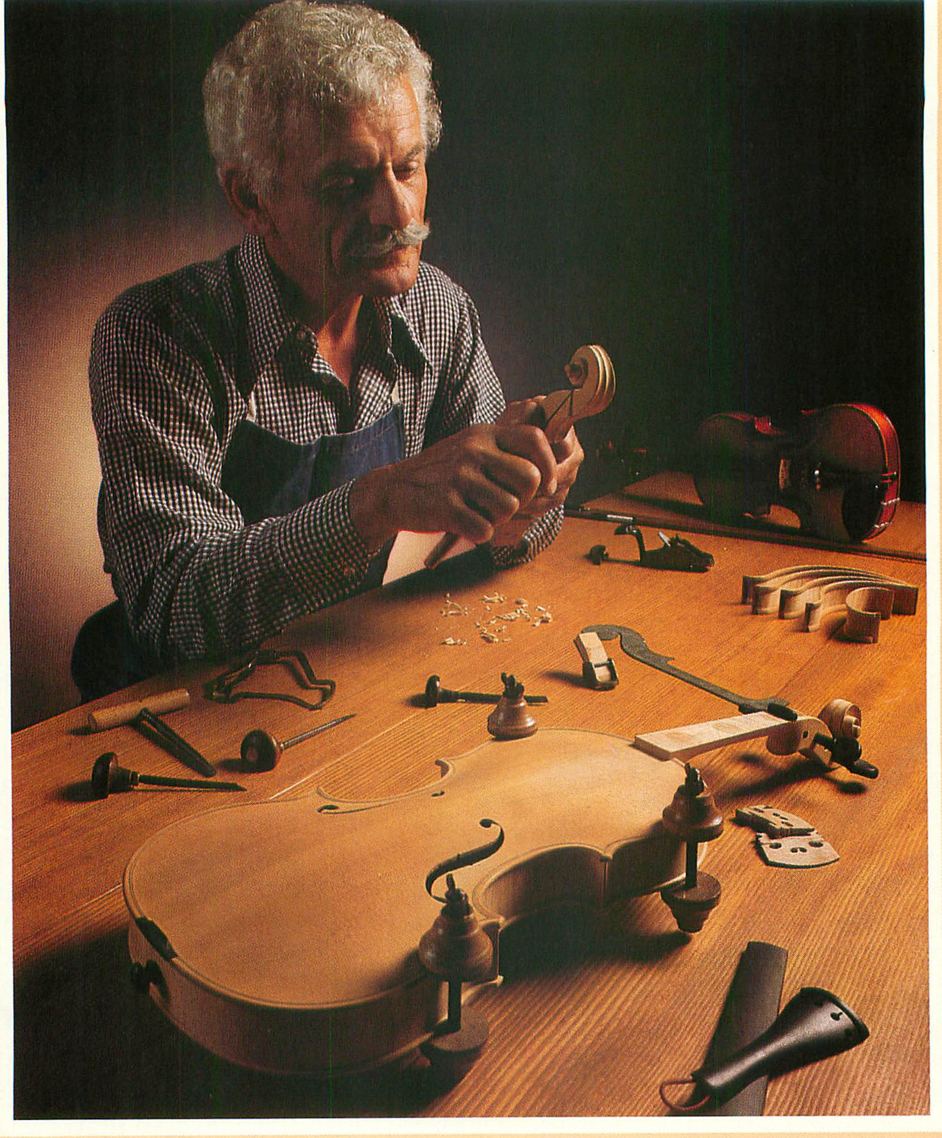
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ARTISTRY IN ELECTRONIC GAMING *continued from page 63*

Why rip-roaring, you ask? Because to capture a square, you must do battle with the piece (if any) occupying it. When you land on a square occupied by an enemy piece, you and the enemy are instantly transported to a special battlefield, where a fight to the death determines the ultimate occupant of the square. It is entirely possibly that both combatants will die.

Each type of icon — there are seventeen types, of widely varying powers — has its own unique mode of attack on the battlefield. The different characteristics — the icon's speed, weapon used, speed of a projectile, the striking force, and interval between attacks — strongly influence the outcome of any battle, but there are additional determinants. Fifty of the squares are either white or black, and stay that way. The other thirty-one squares vary in luminosity, becoming a little darker or a little lighter after every other turn. An icon's strength and endurance bears a direct relationship to the luminance of the square being contested. Obstacles of varying densities appear and disappear in random spots about the battlefield. Depending on their apparent solidity, they may interfere with your icon or its shot.

As you can see, Archon is not a simple game. It is impossible to play Archon meaningfully without reading the instructions thoroughly. But once you become familiar with all the strange new pieces, their moves and powers, and the dynamically changing fields, you may decide, as I have, that Archon combines all the best aspects of existing strategy and arcade games into a new synthesis that is more challenging and enjoyable than any of its progenitors.

Also from Freefall Associates comes the fabulous graphic mystery adventure, **Murder on the Zinderneuf**, by Robert Leyland. Whodunit fans, drop your Agatha Christie and come running — this is your game! Set aboard the luxury dirigible Zinderneuf in 1936, the game's object, naturally, is to solve a murder. You are the detective (you can be one of eight thinly-disguised sleuths from literature), and must identify the murderer from among fifteen survivors on board the Zinderneuf. You may search the dirigible for clues and question all occupants of the liner. Your interrogation style for each suspect is up to you, from easygoing to hard and pushy. You have twelve game hours (about 36 minutes of real time) to solve the crime.

Although I am by no means a fan of the mystery genre, I find I must praise this game. First of all, input to the game is by joystick only — you never touch the keyboard. The ship's deck is portrayed on a vertically scrolling layout four screens high. The graphics, done in GTIA mode, are among the most colorful and attractive I have seen in any game. You and the suspects are portrayed by animated figures roaming the deck. To question someone, just encounter him or her, then choose an interrogation style from a short but thorough list. You may ask your suspect about any person on board. The usefulness of any answers depends on the appropriateness of your style, whom you are asking about, and whom you are asking.

You may make an accusation at any time. If you are correct and have uncovered enough proof, the killer will make a full confession. If, however, you do not have sufficient evidence, or if you accuse the wrong person, you may not question him or her for the rest of the game — a severe liability.

You may quit at any time, whereupon you learn the murderer's identity and motive. Because each game does not use all sixteen characters, and because of the variety of detective's identities (which determines available interrogation styles), every game is quite different.

In **Pinball Construction Set**, Bill Budge has created a totally unique program that is sure to set many precedents. He might alternatively have called it The Ultimate Pinball Editor or Zen and the Art of Pinball Design. It provides a means for you to build the customized pinball machine of your dreams. You start with the blank shape of a pinball machine on the left half of the video screen, and on the right are your materials: a blinking cursor in the form of a pointing hand; a toolkit; and a variety of parts. You pick up parts and position them on the board by moving the cursor with the joystick.

Among the parts used to actually construct the game are flippers, bumpers, kickers, a "black-hole" ball eater, a magnet that imparts a twist to the ball's movement, and a nifty three-ball hopper that can set three balls in play at once. Also, you can place spinners, rollovers, lanes, and targets wherever you like on the board. Assorted polygons are available, and once you've placed them, you can use certain tools to change their shape any way you like. You have a paintbrush, paintpots, and a magnifier with which to detail your board's appearance to the nth degree.

Once you've built your board, you may assign bonus and sound values to various combinations of targets — that is, they must all be hit to score the bonus — or set scoring for any individual target.

You control the ball's apparent weight, how bouncy the sides are, how much kick the bumpers give, and how fast the ball travels. You needn't play with only one ball — you may use as many as you like. You may also use as many flippers as you like. However, the more you add, the slower the final game.

Another handy feature lets you play a sample ball any time during a construction session. For a full-length game, activate the disk. You can save the parameters of your game to disk for future recall and modification. The Make Game option writes your entire game to disk as a binary load file so your friends with ATARI computers (but without the Construction Set) can play it.

The disk comes with five prefabricated games which you can load, play and examine for construction and wiring. These are cleverly designed to inspire you to create even better games. Pinball Construction Set is a marvelous feat of programming, not to mention a potential source of an endless supply of great pinball games for you and your friends.

M.U.L.E. is a game designed by the team at Ozark Softscape — Dan Bunten, Bill Bunten, Alan Watson, and Jim Rushing. From one to four players at-

continued on next page

tempt to colonize a remote planet with the help of a strange robot called a Multiple Use Labor Element, or M.U.L.E. If fewer than four people play, the computer assumes the remaining roles. The M.U.L.E. assists you in settling a plot of land to grow food, produce energy, or mine for Smithore, the mineral used for building M.U.L.E.s.

During each turn, each player, human or computer, has a chance to select a plot of land, then develop it by installing a M.U.L.E. Once all players have done so, a period of production occurs, during which everyone's assets increase or decrease depending on conditions. Then comes the Auction period. The Auction is fairly complicated, but ingeniously implemented with the use of joysticks and graphic charts on the screen. The laws of supply and demand take dramatic effect, careful planning pays off, and lack of planning incurs disaster.

The Beginner's game of M.U.L.E. lasts six rounds. At the end, whoever has the highest net worth will be the winner, or "First Founder" of the colony. You can also play a Standard version or a Tournament version.

I recommend this game highly to parents as a way to teach the principles of economics to their children, while having a lot of fun. Of course, advanced versions are eminently suitable for adults.

WORMS?, by David S. Maynard, takes place in an imaginary world of pure mathematics, with music and geometry. From one to four "worms", each with its own distinctive color, traverse a grid of dots. The "liner notes" inside the game's package urge that you *not* read the instructions — you should play the game and learn its rules by osmosis. I had little luck with this technique, but if you intend to purchase the game and to follow its maker's instructions, read no further. The WORMS? playfield is covered with dots, each constituting the center of a territory. Worms start in the center and can move in one of six directions, leaving a trail behind as they move from center to center. You "train" your worm each time you make a move. Once it recognizes a movement pattern, it will continue to move automatically in that pattern until it is blocked. Then you must give it a new movement instruction. Your worm scores points by occupying a territory, that is, by laying the last (sixth) trail in a territory. Your worm wins points by occupying the most territories before dying, which is what happens when it is blocked in all directions.

A game of WORMS? can be breathtakingly beautiful and agonizingly frustrating all at once. It's a very abstract sort of game whose concept is unusual and original. Electronic Arts is to be congratulated for its confidence in the intelligence of the software-buying public. I hope that this confidence will be borne out, so that the company can bring us even more programs to challenge our intellects and tickle our imagination.

CARDFILE FOR CASSETTES

Low overhead data-base program

by VERN MASTEL

The Electro-Cardfile is a handy data-base filing program for ATARI users with cassette recorders. It is written in BASIC and requires only 16K of RAM.

How many times have you seen an advertisement for a new piece of record-keeping software and wanted it, only to be frustrated by high memory requirements or the need for a disk drive? Having been frustrated myself, I wrote this simple program to take care of my simple data filing and storage needs on cassette.

Electro-Cardfile allows you to process 30 file cards of information. Each card has a title up to 15 characters in length, and information on the card is organized in 10 lines, each 30 characters long. You can title, fill, view, delete, or modify information on any card you choose. An elementary search routine is also provided to allow you to rapidly locate specific information. At any point during usage, you can store the entire card file to tape for future retrieval. And you may optionally use a 40- or 80-column printer to provide hard copy.

Program logic is actually quite simple. The program builds two strings, one containing card titles (SA$) and another containing card data (CD$). As you enter titles or card data, the program calculates the proper position in the string for this information and then places it appropriately. After you have entered or edited these data strings, Electro-Cardfile stores them for you onto cassette tape.

The program's search option is elementary but effective. While it does not search through *all* of your data, it does compare the beginning of each line of every card to a specified search key. Say you have a list of business contacts in your file and you want to find "Insurance Agents" (your search key). Electro-Cardfile will locate a line beginning with "Insurance Agents Names and Addresses." It will not, however, locate "Allied Insurance Agents." The search key (up to 30 characters long) must identically match the first characters of a line.

I wrote this program to get the most powerful program into the least amount of memory. There are no REM statements. I replaced oft-repeated numbers such as 1 and 30 with variables. And I have packed all program lines as fully as possible. An advantage to packing commands on as few statement lines as possible is increased speed of execution! I also placed all calculation subroutines at the head of the program, also to improve execution speed.

PROGRAM CODE

Lines 10 through 50 dimension strings and assign values to variables. Using READ/DATA statements to assign values to variables requires less memory space than assigning values with the actual or implied LET command and the " = " sign.

Lines 100 through 160 contain calculation routines for string position as well as input range checks. Line 100 finds the starting and ending points of the title for a given card. Line 110 finds the starting point of the data for a given card. Line 120 finds the location of a specific line of data on a given card (used when you enter or modify data on a card). Line 130 handles data and title strings when loading from or saving to the cassette recorder. Line 140 clears the screen. Lines 150 through 159 check all keyboard input to make sure it is within expected ranges. Bad keyboard input automatically returns you to the menu. Line 160 fills the unused portion of card data lines with blanks.

Line 500 is the printer routine. You may opt to dump the contents of a card to a printer for hard copy. Lines 1000 through 1030 manage title input and positioning in the title string. Lines 2000 through 2010 list all of the card titles to the screen. Lines 3000 through 3060 manage card data input and positioning of data in the card data string. Lines 4000 through 4040 are used to modify your data entries on any card in the file.

Lines 5000 through 5020 are used to delete a card from the file by overwriting its contents with blanks. Lines 6000 through 6050 display the contents of a selected card. Lines 7000 through 7020 and 8000 through 8020 manage SAVE and LOAD options to and from the cassette recorder. Lines 9000 through 9030 operate the card data search routine. Lines 10000 through 10020 display the menu and allow you to input your selection.

When you first RUN Electro-Cardfile you will see a menu which offers nine options. If you selected Title, Fill, View,

continued on next page

Delete or Modify and then change your mind, you can enter the value "50" for a card or line number to return to the menu. Unacceptable line or card numbers automatically return you to the menu. When you enter titles or card data you are limited respectively to 15 and 30 character maximums. Additional input on the line is ignored.

OTHER DETAILS

Cassette users will note the unusual structure of the OPEN commands on lines 7000 and 8000. The auxiliary code which is normally zero has been changed to 128. This shaves about 30% off the time needed to LOAD or SAVE a complete card file. The ATARI cassette operating system is organized so that when you save data using the PRINT command, records are written to the cassette tape with three seconds of pure tone between them. By setting the auxiliary byte in the OPEN command to 128 the time delay between records is reduced practically to zero. This works fine for SAVE, but when you try to LOAD your data back into the computer, it can't take the data as fast as the tape is delivering it! An error status is generated and program execution stops.

The loop "FOR I = 1 TO 50 :NEXT I" in the save routine puts just enough delay between the data records that the error status is avoided, still giving you about a 30% time saving. Users of Tiny Text (see ANTIC V.1, No. 6) might also note that this technique will help them speed up text filing. I arrived at this delay factor by trial and error (Atari literature suggests that timing must be a function of program software). The 1 to 50 loop has been reliable for cassette work on my own system, but individual systems may require more delay (or possibly less). This method only seems to work with PRINT and INPUT commands, though, as I had no success when I tried it with PUT and GET. Trial and error seems the only way to find out.

If you wish to adapt Electro-Cardfile for disk operation, you may change lines 30, 7000, 7010, 7020, 8000, 8010, and 8020. The statement lines which you should substitute are found at the end of the program listing.

Electro-Cardfile has been a handy tool for my own use, and I hope that others will find it a useful addition to their software libraries.

VARIABLE LIST DEFINITIONS

A$ — Keyboard input
CD$ — Card data string
SA$ — Card title string
TR$ — Load/save transfer string
WS$ — Card data input string
C$ — Card data input string
A — Position calculation variable
B — Beginning point of string
C — Card number
CH — Menu choice variable
E — Ending point of string
L — Line number
M — Number 15
N — Number 10
O — Number 30
P — Number 1
S — Counting variable
CAL1 — Subroutine at line 100
CAL2 — Subroutine at line 110
CAL3 — Subroutine at line 120
CAL4 — Subroutine at line 130
CHK — Range check subroutines lines 150-159
FILL — Subroutine at line 160
MENU — Menu routine line 10000-10020
SCN — Screen Clear Command

```
5 REM VERN L. MASTEL-THE ELECTRO-CARDF
ILE ** ANTIC MAGAZINE **
10 DIM SA$(450),WS$(15),A$(2),CD$(9000
),TR$(90),C$(30):SA$(1)="  ":SA$(450)="
 ":SA$(2)=SA$
20 CD$(1)=" ":CD$(9000) = "   ":CD$(2)=CD$
:? CHR$(125)
40 READ P,O,N,M,MENU,CAL1,CAL2,CAL3,CA
L4,SCN,FILL,CHK,CL:GOTO MENU
50 DATA 1,30,10,15,10000,100,110,120,1
30,140,160,150,170
100 B=(M*(C-P)+P):E=B+14:RETURN
110 F=300*(C-P):RETURN
120 B=(O*(A-P)+P):E=B+29:B=B+F:E=E+F:R
ETURN
130 B=90*(A-P)+P:E=B+89:RETURN
140 ? CHR$(125):RETURN
150 IF C=50 OR L=50 THEN 159
155 IF C<0 OR L<0 THEN 159
156 IF L>10 OR C>30 THEN 159
157 RETURN
159 POP :L=0:C=0:GOSUB SCN:GOTO MENU
160 FOR S=LEN(C$)+P TO O:C$(LEN(C$)+P)
=" ":NEXT S:RETURN
170 C=0:L=0:RETURN
500 GOSUB CAL1:LPRINT SA$(B,E):GOSUB C
AL2:FOR L=P TO N:A=L:GOSUB CAL3:LPRINT
 CD$(B,E):NEXT L:GOSUB SCN:GOTO MENU
1000 GOSUB SCN:? "WHICH CARD DO YOU WI
SH TO TITLE":GOSUB CL:INPUT C:GOSUB CH
K:? "INPUT TITLE OF CARD #";C
1005 TR$="|----- -----------|":?TR$:INP
UT WS$
1010 ON LEN(WS$)=M GOTO 1030:FOR S=LEN
(WS$)+P TO M:WS$(LEN(WS$)+P)="  ":NEXT
S
1030 GOSUB CAL1:SA$(B,E)=WS$:GOTO MENU
```

continued on page 74

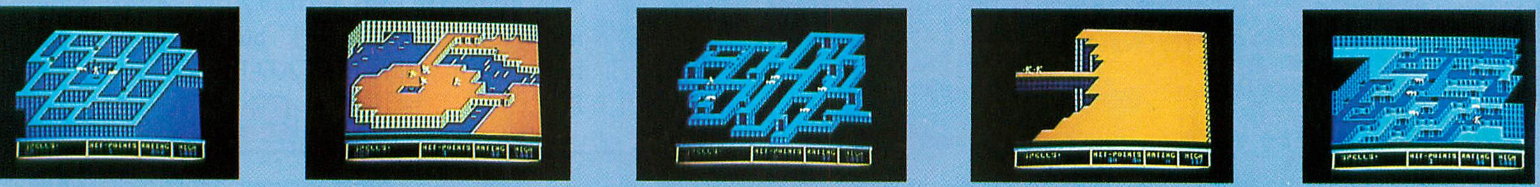
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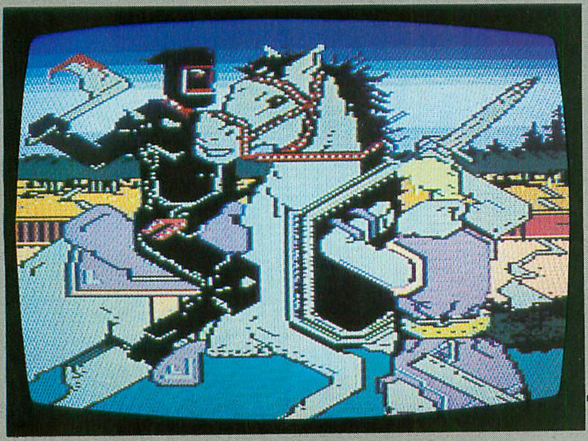
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microscreens

by MIKE SULLIVAN

Mike Sullivan had a special reason for laboring so hard on these examples of computer art—he works for the company that makes the program he used to create them. International Software Marketing, of Syracuse, New York, has developed a 16K ROM cartridge called **Color Magic**, written by Ron Roberts. A version of the program has been sold to Epyx Software, and is being marketed as **Fun With Art**.



Color Magic is special because it permits all 128 Atari colors to be used at once, according to Sullivan. The first of his pictures shown here is *Landscape* demonstrating the possibility of depicting a lot of featues in some detail. The *Knights in Combat* was done to show Epyx the power of Color Magic, and the *Giant at Home* is part of a series for an animated story of Jack and the Beanstalk.



Mike Sullivan was trained as a graphics artist at the Center for Creative Studies in Detroit, Michigan. He also did freelance illustration for magazines. He began micro-art last year after joining International Software Marketing. He uses a variety of microcomputers at work, but at home his machine is an ATARI 800.



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CARD FILE FOR CASSETTES *continued from page 70*

```
2000 GOSUB SCN:FOR C=P TO M:GOSUB CAL1
:? C;"  ";SA$(B,E);"  ";C+M;"  ";SA$(B+22
5,E+225):NEXT C:ON FLAG GOTO 6020
2010 GOTO MENU
3000 GOSUB SCN:? "WHICH CARD DO YOU WI
SH TO FILL":GOSUB CL:INPUT C:GOSUB CHK
:? "HOW MANY LINES DO YOU NEED":INPUT
L
3010 GOSUB CHK:? "NOW ENTER THE DATA":
TR$=" |------------------------------|
":? TR$
3020 GOSUB CAL2:FOR CF=P TO L:? CF;:IN
PUT C$:ON LEN(C$)=O GOTO 3040:GOSUB FI
LL
3040 A=CF:GOSUB CAL3:CD$(B,E)=C$:NEXT
CF:FOR CF=L+P TO N:ON L+P>N GOTO MENU
3060 C$="
  ":A=CF:GOSUB CAL3:CD$(B,E)=C$:NEXT C
F:GOTO MENU
4000 GOSUB SCN:? "WHICH CARD DO YOU WI
SH TO CHANGE":GOSUB CL:INPUT C:GOSUB C
HK
4005 ? "ENTER THE LINE NUMBER YOU WISH
 TO CHANGE":INPUT L:GOSUB CHK
4010 GOSUB CAL2:A=L:GOSUB CAL3:? "INPU
T NEW LINE# ";L:INPUT C$:ON LEN(C$)=O
GOTO 4040:GOSUB FILL
4040 CD$(B,E)=C$:? "DO YOU WISH TO CHA
NGE ANOTHER LINE Y/N":INPUT A$:ON A$="
Y" GOTO 4005:GOTO MENU
5000 GOSUB SCN:? "WHICH CARD DO YOU WI
SH TO DELETE":GOSUB CL:INPUT C:GOSUB C
HK
5010 ? "DELETING CARD #";C:GOSUB CAL1:
FOR S=B TO E:SA$(S,S)=" ":NEXT S:B=300
*(C-P)+P:E=B+299:FOR S=B TO E
5020 CD$(S,S)=" ":NEXT S:? "DELETION C
OMPLETE":GOTO MENU
6000 GOSUB SCN:FLAG=0:? "DO YOU NEED T
O SEE THE CARD LIST Y/N":INPUT A$:IF A
$="Y" THEN FLAG=P:GOTO 2000
6020 ? "WHICH CARD DO YOU WISH TO VIEW
":GOSUB CL:INPUT C:GOSUB CAL1:GOSUB SC
N:POSITION 13,P:? SA$(B,E)
6030 GOSUB CAL2:FOR L=P TO N:A=L:GOSUB
 CAL3:? CD$(B,E):NEXT L
6040 POSITION P,18:? "THAT'S ALL OF TH
E ENTRIES, DO YOU WANT A COPY Y/N":INP
UT A$:IF A$="Y" THEN GOTO 500
6050 GOSUB SCN:GOTO MENU
7000 OPEN #3,8,128,"C":FOR A=P TO 5:GO
SUB CAL4:TR$=SA$(B,E):PRINT #3;TR$:FOR
 I=P TO 50:NEXT I:NEXT A
7010 FOR A=P TO 100:GOSUB CAL4:TR$=CD$
(B,E):PRINT #3;TR$:FOR I=P TO 50:NEXT
I:NEXT A:CLOSE #3
7020 ? "SAVE COMPLETE":GOTO MENU
8000 OPEN #3,4,128,"C":FOR A=P TO 5:GO
SUB CAL4:INPUT #3;TR$:SA$(B,E)=TR$:NEX
T A
8010 FOR A=P TO 100:GOSUB CAL4:INPUT #
3;TR$:CD$(B,E)=TR$:NEXT A
8020 CLOSE #3:? "INPUT COMPLETE":GOTO
MENU
9000 GOSUB SCN:? "INPUT SEARCH KEY":IN
PUT C$:LN=LEN(C$):FOR S=P TO O:C=S:GOS
UB CAL2:FOR CD=P TO N
9010 B=(O*(CD-P)+P)+F:E=B+(LN-P):IF CD
$(B,E)=C$ THEN ? "------MATCH FOUND IN
 #";S;"-----":? CD$(B,B+29)
9030 NEXT CD:NEXT S:? "SEARCH COMPLETE
":GOTO MENU
10000 TRAP 10000:? " TITLE 1..LIST 2..F
ILL 3..MODIFY 4":? "DELETE 5..VIEW 6..
SAVE DATA 7"
10005 ? "INPUT DATA 8..SEARCH DATA 9"
10010 INPUT CH:IF CH>0 AND CH<10 THEN
GOTO CH*1000
10020 GOSUB SCN:GOTO MENU
```

TYPO TABLE

Variable checksum = 634565

Line num		range	Code	Length
5	-	140	OY	507
150	-	1030	GU	464
2000	-	4005	VN	530
4010	-	6020	RZ	507
6030	-	8020	WM	507
9000	-	10020	ER	372

```
1 REM *** ELECTRO-CARDFILE ***
2 REM ** DISK MODIFICATIONS **
3 REM ************************
30 DIM D$(14),DF$(14):D$="D:"
7000 GOSUB SCN:? "INPUT FILENAME TO S
AVE":INPUT DF$:D$(LEN(D$)+1)=DF$:OPEN
#3,8,0,D$
7010 FOR A=P TO 5:GOSUB CAL4:TR$=SA$(B
,E):? #3;TR$:NEXT A
7020 FOR A=P TO 100:GOSUB CAL4:TR$=CD$
(B,E):? #3;TR$:NEXT A:CLOSE #3:GOSUB S
CN:? "SAVE COMPLETE":GOTO MENU
8000 GOSUB SCN:? "INPUT FILE NAME":INP
UT DF$:D$(LEN(D$)+1)=DF$:OPEN #3,4,0,D
$
8010 FOR A=P TO 5:GOSUB CAL4:INPUT #3;
TR$:SA$(B,E)=TR$:NEXT A
8020 FOR A=P TO 100:GOSUB CAL4:INPUT #
3;TR$:CD$(B,E)=TR$:NEXT A:CLOSE #3:GOT
O 2000
```

WHAT IS A TYPO TABLE

Newcomers to ANTIC may wonder about the "Typo Table" that appears at the end of most of our basic listings. TYPO is a program that helps you find typing errors made when entering programs that appear in ANTIC. TYPO will produce a table of values which can be used to pinpoint where an error was made. The TYPO program and instructions originally appeared in Volume 1, Number 3 of ANTIC, and was reprinted in Volume 2, Number 1. The latter issue is still available as a back issue, and the TYPO program itself is included in ANTIC UTILITIES DISK #2. Also, you can obtain a copy of the article by sending a stamped, self-addressed envelope to: c/o ANTIC, 600 18th Street, San Francisco, CA 94107. We regret we cannot fulfill requests unless SASE is included.

NOTE: When comparing your TYPO TABLE with the one we publish, first look at the length column. For a given line number range, if your length is only off by one or two, it may be due to spacing. Missing or extra spaces generally occur between quotes or in a REM statement. Spaces must be accurately placed for TYPO to work, so first experiment with the spacing.

FORTH ASSEMBLER

New approach to ATARI graphics

by THOMAS McNAMEE

The title of this article may be a bit confusing — is it about Forth or assembly language? Well, it's about both. This article demonstrates a powerful feature of Forth: any language, new or existing, can be written in it. Assemblers written in Forth combine the power of Forth with the speed of machine code. Because assembly is taking place under the Forth system control, macro capability and complex arithmetical calculations are available during compilation. Some features of the ATARI, such as display list interrupts and vertical blank routines, can be written only in 6502 machine code; these are the applications addressed in this article. But first we will cover some of the essentials of Forth assembler.

THE FORTH ASSEMBLER

Because Forth is a stack-based language, it appears to be written "backwards". The same is true for the Forth assembler. Here is a comparison of some traditional instructions versus Forth:

Traditional	Forth
LDA 712	712 LDA,
ST COUNT,X	COUNT ,X STA,
INX	INX,

Read the INX, instruction as "compile the opcode for the Increment X instruction." Note that Forth instructions require the operand to precede the operation. In the second example above, COUNT has been defined previously as a constant, so that its address appears on the stack before the indexed store command is compiled. The display list example contains a standard ATARI assembler listing which is the equivalent to the Forth word GR7DLI; it demonstrates the "backwards" instruction coding and a comparison of control structures.

In traditional assemblers, the instructions which control program execution are limited to Branch and Jump group of insructions. Since there is no label field in Forth assemblers, jumping around inside a definition is not possible. In making up for the lack of a label field, the Forth assembler allows for many more ways to control program flow. The IF..ENDIF and IF..ELSE..ENDIF can be used to control execution based on the tested status of the Sign, Overflow, Zero, and Carry flags. Operation of these words is identical to the same structure in Forth. Other Forth control structures which are repeated in the Forth assembler include BEGIN..UNTIL, BEGIN.. WHILE .. REPEAT, and BEGIN .. AGAIN. These combine to create a powerful set of control structures which greatly simplify programming.

You must know the rules of parameter passing to use the Forth assembler. Follow these rules whenever you use an assembly language definition along with other Forth words. The most important rule is that the X register must be preserved. It is the pointer to the top of the parameter stack and should be manipulated only when changes to the stack are desired. The second rule is that every assembly language definition must end with an appropriate re-entry jump; these jumps link the assembler definition with the rest of Forth. Of course, if a subroutine is being written, it may end in RTS. Two of the examples in this article end in other ways. However, these words are never executed within Forth, as their return statements would cause the ATARI to lock up. Selection of the appropriate re-entry point will depend on your requirements for the stack; these points are fully described in the assembler documentation.

VERTICAL BLANK ROUTINES

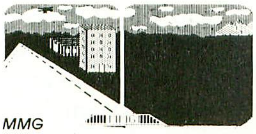
Screens 10 through 13 are the words needed to install and test a vertical blank routine. The first screen contains the word SUBROUTINE, which is supplied in the ValFORTH documentation. This is a defining word which returns its address when executed; it also invokes the ASSEMBLER vocabulary. It is used on both the vertical blank routine and the display list interrupt, and it passes its address to the Forth word responsible for installing the routine.

The definition of INSTALL is a good example of a traditional Forth assembler word. Note that INSTALL begins with CODE instead of ':', and ends with a C; instead of ';'. These are defining words which switch in the ASSEMBLER vocabulary while the definition is being compiled. The word INSTALL is designed to synchronously set the deferred vertical blank vector; this prevents the vertical blank routine from occurring while the new vector is being set up.

continued on page 78

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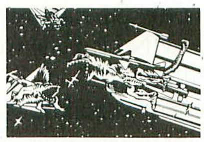
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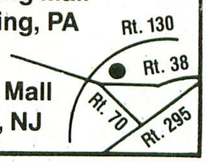
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FORTH ASSEMBLER

continued from page 76

INSTALL can also be used to set vectors for system timers 1–5 and the immediate vertical blank by changing the #7 in line 10 of screen 11 as follows:

Vector	Value
Timer 1–5	# 1–5
Imm. VBLANK	# 6

Screen 12 contains the world VBLANK, which turns the routine on and off, and uses INSTALL to insert the address in the appropriate subroutine. Screen 13 contains the vertical blank subroutine, a simple word which increments the background color in any graphics mode. TEST is the word which brings it all together, installing the address and diverting the vertical blank flow through the subroutine ROTBAK. Note that ROTBAK ends with JVB JMP,. JVB is the re-entry point for the vertical blank routine and is defined as a constant on screen 11. All vertical blank routines must end this way.

To use, LOAD screens 10–13 and type TEST. The background color should begin to change. To turn off this routine, type OFF VBLANK. It is important to remember to turn off vertical blank routines before doing anything to the Forth dictionary. If you FORGET all or part of your routine, the vertical blank vector will be pointing at nothing, and the machine will lock up.

DISPLAY LIST INTERRUPTS

This gets a little more spectacular. Screens 20 through 23 contain the installation word, the display list modifier, and a test word. Screen 20 is the display list equivalent of the INSTALL word used in vertical blanks. DLI installs the subroutine address and enables display list interrupts. DLIMOD, on screen 21, sets the interrupt bit on each Graphics 7 instruction in the display list. Screen 22 is the actual interrupt routine.

GR7DLI increments the variable COUNTR each time the subroutine is called. Since there are 79 interrupts in our modified display list, COUNTR is reset to zero after 79 (hex 4F) executions. COUNTR is used in the X register as an index into COLTAB (color table) which is really page 2. The color selection in this example is therefore random, but COLTAB could easily point to a user-defined color table. GR7DLI is the Forth translation of the routine which appears on pages 5–6 of *De Re Atari*, which also contains an excellent discussion of display list interrupts and their application. Note that the subroutine GR7DLI ends with RTI, since it will be called as an interrupt by the operating system. 80COLORS is optimistically named, since many of the colors from our page two color table are black, but it does produce an interesting display when executed. Note that screen 22 uses SUBROUTINE, so screen 10 must be loaded first.

Accompanying this example is a listing of GR7DLI (Listing 2) written with the Atari Assembler Editor. Check this listing with screen 22 to see how the Forth assembler compares. It may be easier to learn the "backward" assembler using this as a basis for comparison.

COMBINING BOTH TECHNIQUES

After loading screens 20–23, try screens 24 and 25. RAINBOW is a routine which increments COUNTR, then makes it the background color. This makes every line on the screen a different color. After 79 interrupts, COUNTR is reset to the value of RESET. SPECTRUM installs RAINBOW and turns the DLI routine on. CYCLE is a vertical blank routine that either increments or decrements COUNTR based on the value of MVFLG. MOVECOLORS uses the constants UP or DOWN to determine the direction of color movement on the screen. To make the colors swim upwards, type UP MOVECOLORS; DOWN MOVECOLORS moves them down. This is not a scroll routine; try some PLOT and DRAWTO statements and note that the drawn figure stays stationary while the background colors move.

The Forth assembler can be used to code critical routines for speed, and it can be used for machine language routines such as those described above. For further study in this area, I recommend ValFORTH's 6502 Macro Assembler, and *De Re Atari*, available from APX.

Listing 1

```
Scr #10
   ( GRAPHICS - SUBROUTINE WORD   )
   : SUBROUTINE
       O VARIABLE
       -2 ALLOT
       [COMPILE] ASSEMBLER
       ?EXEC !CSP ;              -->

     Thanks to Valpar International
     for the use of this word.
```

```
Scr #11
   ( VBLANK EQUATES, INSTALL        )
   HEX
   224 @ CONSTANT OLDBLANK
   E45C  CONSTANT SETVBL
   E462  CONSTANT JVB

   DECIMAL

   CODE INSTALL ( ADDR -- )
    # 1 LDA, SETUP JSR, XSAVE STX,
    N LDY, N 1+ LDX, # 7 LDA,
    SETVBL JSR,
    XSAVE LDX,
    NEXT JMP, C;

                           -->
```

```
SCR #12
   ( GRAPHICS - VBLANK ROUTINE     )
   0 CONSTANT OFF
   1 CONSTANT ON

   : VBLANK ( ADDR/ON or OFF -- )
       IF INSTALL
       ELSE OLDBLANK INSTALL
       ENDIF ;
                                -->
     To use:
    Compose SUBROUTINE, then turn
    on with:
        SUBROUTINE ON VBLANK
    Turn off with:
        OFF VBLANK
```

```
Scr #13
  ( GRAPHICS - TEST VBLANK       )
  SUBROUTINE ROTBAK
   712 INC, ( INCREMENT COLOR4 )
   JVB JMP, ( MUST END THIS WAY )

  : TEST
     ROTBAK ON VBLANK ;

Scr #20
  ( DISPLAY LIST INSTALLATION    )
  : DLI ( ADDR/ON or OFF -- )
     IF 192 54286 C! 512 !
     ELSE 64 54286 C!
     ENDIF;

                          -->

  To use:
     Compose SUBROUTINE, then
  turn on with:
     SUBROUTINE ON DLI
  Turn off with:
     OFF DLI

Scr #21
  ( MODIFY THE GR. 7 DISPLAY LIST)
  : DLIMOD
     7 GR.
     560 @ ( FIND DISPLAY LIST )
     DUP 85 + SWAP 6 +
      DO I C@ 128 + I C!
      LOOP ;

                          -->

Sets the high bit in every mode
7 (Antic D) line.

Scr #22
  ( DISPLAY LIST INTERRUPT       )
  HEX
  0 VARIABLE COUNTR
  D01A CONSTANT COLBAK
  D40A CONSTANT WSYNC
  0200 CONSTANT COLTAB

  SUBROUTINE GR7DLI
    PHA, TXA, PHA, COUNTR INC,
    COUNTR LDX, COLTAB ,X LDA,
    WSYNC STA, COLBAK STA,
    # 4F CPX,
     EQ IF, # 0 LDA, COUNTR STA,
     ENDIF,
    PLA, TAX, PLA, RTI, C;
   DECIMAL                    -->

SCR #23
  ( 80 COLORS ON THE SCREEN !     )
  : 80COLORS
     DLIMOD
     GR7DLI ON DLI ;

SCR #24
  ( GRAPHICS 7 RAINBOW           )
  0 VARIABLE RESET
  SUBROUTINE RAINBOW
   PHA, COUNTR INC, COUNTR LDA,
   WSYNC STA, COLBAK STA,
   SEC, RESET SBC,
   # 79 CMP,
    EQ IF, RESET LDA, COUNTR STA,
    ENDIF,
   PLA, RTI, C;

  : SPECTRUM
     DLIMOD
     RESET @ COUNTR !
     RAINBOW ON DLI ;
                          -->

Scr #25
  ( CYCLE THE COLORS IN VBLANK     )
  1 VARIABLE MVFLG
  SUBROUTINE CYCLE
   PHA, MVFLG LDA,
    EQ IF, COUNTR INC,
    ELSE,COUNTR DEC,
    ENDIF,
   PLA, JVB JMP, C;

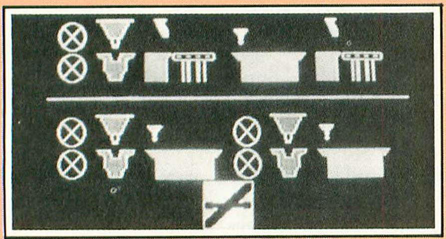
  1 CONSTANT UP
  0 CONSTANT DOWN

  : MOVECOLORS ( UP or DOWN -- )
     MVFLG !
     CYCLE ON VBLANK
     SPECTRUM ;           -->
```

Listing 2

```
0100 ; ATARI Assembler Editor
0110 ; equivalent to the Forth word
0120 ; GR7DLI
0130 ;
0140          *= $600
0150 ;
0160 COLBAK   =  $D01A
0170 WSYNC    =  $D40A
0180 COLTAB   =  $0200
0190 ;
0200 GR7DLI
0210          PHA
0220          TXA
0230          PHA
0240 ;
0250          INC COUNTR
0260          LDX COUNTR
0270          LDA COLTAB,X
0280          STA WSYNC
0290          STA COLBAK
0300          CMP #$4F
0310          BNE ENDDLI
0320          LDA #0
0330          STA COUNTR
0340 ;
0350 ENDDLI
0360          PLA
0370          TAX
0380          PLA
0390          RTI
0400 ;
0410 COUNTR   .BYTE 0
```

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$23.95 (each disk)

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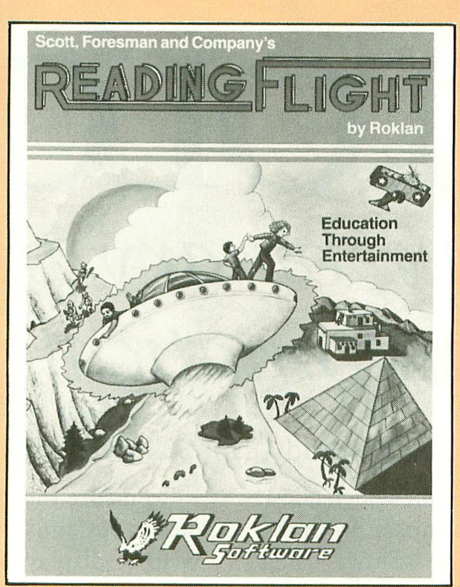
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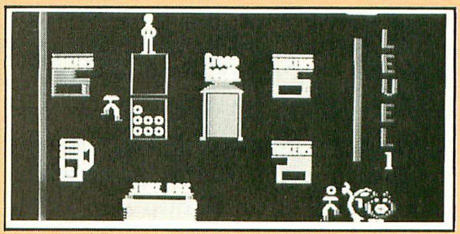
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BINARY AUTOLOAD

Run your binary programs automatically

by ED and JEFF SCHNEIDER

There are a number of utility programs available which allow a user to boot a disk and RUN a program chosen from the disk directory. Such utility programs are written using AUTORUN.SYS files. They read the disk directory, display the appropriate program names, and allow the user to select a specific program. Use of these utilities has been generally restricted to programs written in BASIC. The utility program presented here now allows you to RUN *binary* programs automatically.

Atari, for example, markets numerous programs through the Atari Program Exchange (APX) which are written in machine language. To RUN these or other machine language programs requires the user to call up the Disk Operating System (DOS) and select the "L" (BINARY LOAD) option. The user must then enter the desired program name (usually an abbreviation which cannot be remembered or deciphered) and press [RETURN]. The program then executes. With BINARY AUTOLOAD there is an easier way!

When you boot a disk which has this utility residing on it, you are presented with a menu which lists only those programs you desire to be displayed and only one key must be pressed to run your selected program. BINARY AUTOLOAD also conserves disk storage space because you may now put as many as twenty-six machine language programs and/or routines on a single disk. For those of you who have many machine language utilities, this program will be helpful.

We use this program to store several games on one disk. In the past, we stored our machine language games on individual disks and named each "AUTORUN.SYS" so that we could boot them automatically. Now we simply fill the disk with games and select from the menu after booting. This utility uses only seven sectors of diskette space.

Ed and Jeff Schneider are a father and son team who have been writing ATARI software since 1979. Ed has been in electronics and computers for twenty years, and Jeff is taking a degree in computer science.

To insure that the menu displays only the programs you desire, you must add the extender .OBJ to the filenames you wish to display on boot-up. If, for example, you use a renumbering utility, you may call it RENUMBER but rename it RENUMBER.OBJ so it will be recognized and displayed in the menu. If there are any programs you do *not* wish displayed in the menu, simply do not add the .OBJ extender. OBJ was selected as an extender because it is routinely used to indicate assembled source code and you may already have a number of such files on your disks. The OBJ extender is not displayed with the program name in the menu; only the first eight characters are displayed.

Enter the source code of BINARY AUTOLOAD using your Assembler-Editor cartridge then assemble the program, saving both the source code and the object code to your disk. After saving the program, enter DOS and LOAD the object code using the "L" (BINARY LOAD) command. Now, using the "K" (BINARY SAVE) command, re-save the object code using the following format:

D:AUTORUN.SYS,3800,3B0F,,3800

You will now have a working AUTORUN.SYS file on your disk!

To use the BINARY AUTOLOAD program, simply copy the AUTORUN.SYS file to any disk. When the disk is booted, the utility will search for programs or files with an OBJ extender and display them by name and allow you to choose from among them.

```
10 ;BINARY AUTOLOAD
20 ;BY Jeff & Ed Schneider
30 ;ANTIC Magazine
40 COUNT=$CF ;COUNT HOLDS # OF FILES
50 ARRAY=$3700 ;ARRAY HOLDS FILE NAMES
60 PRINT=$37D0 ;PRINT BUFFER FOR NAMES
70 TEMP=$37EE ;TEMPORARY STORAGE
80  *=$3800 ;ORG AND RUN ADDRESS OF UTILITY
90  LDA #ARRAY&255
```

```
0100  STA $CB
0110  LDA #ARRAY/256
0120  STA $CC
0130  STA $CE
0140  JSR OPENSCREEN
0150  LDA #16
0160  STA $2C6
0170  INC $2F0
0180  LDY #0
0190  STY $56
0200  STY COUNT
0210  TYA
0220  INY
0230  STY $54
0240  INY
0250  STA ($58),Y
0260  LDA #9
0270  STA $55
0280  STA $52
0290  LDA #30
0300  STA $53
0310  LDX #96
0320  LDA #9 ;PRINT SCREEN TITLES
0330  STA $342,X
0340  LDA #TOP&255
0350  STA $344,X
0360  LDA #TOP/256
0370  STA $345,X
0380  LDA #66
0390  STA $348,X
0400  JSR $E456
0410  LDA #2
0420  STA $52
0430  LDA #39
0440  STA $53
0450  LDA #21
0460  STA $54
0470  LDA #4
0480  STA $55
0490  LDX #96
0500  LDA #BOTTOM&255
0510  STA $344,X
0520  LDA #BOTTOM/256
0530  STA $345,X
0540  LDA #32
0550  STA $348,X
0560  JSR $E456
0570  LDX #16 ;OPEN DISK DIRECTORY
0580  LDA #3
0590  STA $342,X
0600  LDA #DISK&255
0610  STA $344,X
0620  LDA #DISK/256
0630  STA $345,X
0640  LDA #6
0650  STA $34A,X
0660  LDA #0
0670  STA $34B,X
0680  JSR $E456
0690 READIN LDX #16 ;READ FILE NAME
0700  LDA #7
0710  STA $342,X
0720  LDA #TEMP&255
0730  STA $344,X
0740  LDA #TEMP/256
0750  STA $345,X
0760  LDA #18
0770  STA $348,X
0780  LDA #0
0790  STA $349,X
0800  JSR $E456
0810  BMI A3 ;IF NO MORE NAMES, BRANCH
0820  LDY #10
0830  LDX #1
0840 A1 LDA TEMP,Y ;CHECK FOR "OBJ"
0850  CMP EXT,X    ;EXTENDER
0860  BNE READIN
0870  INX
0880  INY
0890  CPY #13
0900  BNE A1
0910  LDY #0
0920  LDX #2
0930 A2 LDA TEMP,X ;IF "OBJ", TRANSFER
0940  STA ($CB),Y  ;FILE NAME TO ARRAY
0950  INX
0960  INY
0970  CPY #8
0980  BNE A2
0990  INC COUNT    ;INCREMENT FILE
1000  LDA COUNT    ;COUNTER & CHECK
1010  CMP #26      ;FOR 26 NAMES
1020  BEQ A3
1030  JSR INCPTR
1040  BNE READIN   ;READ NEXT FILE
1050 A3 LDX #16    ;CLOSE DIRECTORY
1060  LDA #12
1070  STA $342,X
1080  JSR $E456
1090  LDA COUNT    ;PRINT MESSAGE IF
1100  BNE A4       ;NO "OBJ" FILES
1110  JMP PRINTNONE
1120 A4 LDA #6
1130  STA $54
1140  LDA #1
1150  STA $E1
1160  LDA #ARRAY&255
1170  STA $CB
1180 PRINTAGAIN LDA #32
1190  LDY #0
1200 A5 STA PRINT,Y
1210  INY
1220  CPY #30
1230  BNE A5
1240  LDA #5
1250  STA $55
1260  LDA COUNT
1270  AND #1
1280  STA $E2
1290  LDA COUNT
1300  LSR A
```

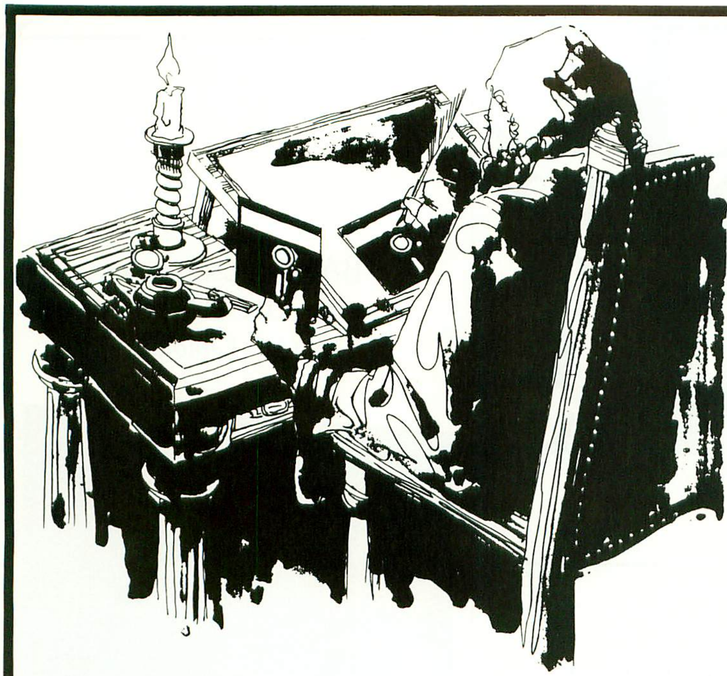
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```
1310  CLC
1320  ADC $E2
1330  STA $E0
1340  LDA $E1
1350  CLC
1360  ADC #192
1370  STA PRINT
1380  LDA #174
1390  STA PRINT+1
1400  LDY #0
1410  LDX #3
1420 A6 LDA ($CB),Y
1430  STA PRINT,X
1440  INY
1450  INX
1460  CPY #8
1470  BNE A6
1480  LDA $E2
1490  BEQ A7
1500  LDX $E0
1510  CPX $E1
1520  BEQ A9
1530 A7 LDA PRINT
1540  CLC
1550  ADC $E0
1560  STA PRINT+19
1570  LDA #174
1580  STA PRINT+20
1590  LDY #0
1600  LDX #22
1610  LDA $CC
1620  STA $CE
1630  LDA $E0
1640  ASL A
1650  ASL A
1660  ASL A
1670  CLC
1680  ADC $CB
1690  STA $CD
1700 A8 LDA ($CD),Y
1710  STA PRINT,X
1720  INY
1730  INX
1740  CPY #8
1750  BNE A8
1760 A9 LDX #96     ;PRINT FILE NAMES
1770  LDA #9
1780  STA $342,X
1790  LDA #PRINT&255
1800  STA $344,X
1810  LDA #PRINT/256
1820  STA $345,X
1830  LDA #30
1840  STA $348,X
1850  JSR $E456
1860  JSR INCPTR
1870  INC $E1
1880  LDA $E1
1890  CMP $E0
1900  BCS A10
1910  JMP PRINTAGAIN
1920 A10 BNE GETKEY
1930  JMP PRINTAGAIN
1940 GETKEY LDA #255
1950  STA $2FC
1960 A11 LDA $2FC  ;CHECK FOR KEYPRESS
1970  CMP #255
1980  BEQ A11
1990  LDY #0
2000 LOOP LDA KEYS,Y
2010  CMP $2FC      ;IS KEY LEGAL?
2020  BEQ LOAD
2030  INY
2040  CPY COUNT
2050  BNE LOOP
2060  LDA #253      ;IF NOT RING BELL
2070  JSR $F6A4
2080  JMP GETKEY
2090 LOAD TYA       ;YES?  BRANCH HERE
2100  TYA
2110  ASL A
2120  ASL A
2130  ASL A
2140  STA $CB
2150  LDY #0
2160  LDX #2
2170 A12 LDA ($CB),Y
2180  CMP #32
2190  BEQ A13
2200  STA FILE,X
2210  INY
2220  INX
2230  CPY #8
2240  BNE A12
2250 A13 LDY #0
2260 A14 LDA EXT,Y ;GET FILE NAME
2270  STA FILE,X    ;FROM ARRAY
2280  INY
2290  INX
2300  CPY #14
2310  BNE A14
2320  LDX #96
2330  LDA #12
2340  STA $342,X
2350  JSR $E456
2360  JSR OPENSCREEN
2370  LDX #16       ;OPEN FILE
2380  LDA #3
2390  STA $342,X
2400  LDA #FILE&255
2410  STA $344,X
2420  LDA #FILE/256
2430  STA $345,X
2440  LDA #0
2450  STA $349,X
2460  LDA #4
2470  STA $34A,X
2480  JSR $E456
2490  LDA #255
2500  STA $2FC
2510  LDA #47
```

continued on page 86

BINARY AUTOLOAD *continued from page 84*

```
2520  STA $2E0
2530  LDA #16
2540  STA $2E1
2550  JMP $15C8    ;JUMP TO DOS LOAD ROUTINE
2560 PRINTNONE LDA #12
2570  STA $54      ;IF NO "OBJ" FILE
2580  LDA #7       ;PRINT MESSAGE
2590  STA $55
2600  LDX #96
2610  LDA #9
2620  STA $342,X
2630  LDA #NOFILE&255
2640  STA $344,X
2650  LDA #NOFILE/256
2660  STA $345,X
2670  LDA #27
2680  STA $348,X
2690  JSR $E456
2700 END JMP END
2710 OPENSCREEN LDX #96
2720  LDA #3
2730  STA $342,X
2740  LDA #GR&255
2750  STA $344,X
2760  LDA #GR/256
2770  STA $345,X
2780  LDA #12
2790  STA $34A,X
2800  LDA #0
2810  STA $34B,X
2820  JSR $E456
2830  RTS
2840 INCPTR CLC
2850  LDA $CB
2860  ADC #8
2870  STA $CB
2880  RTS
2890 GR .BYTE "S:"
2900 TOP .BYTE 2,13,13,13,13,13,13,13,13,13,13
2910  .BYTE 13,13,13,13,13,13,13,13,13,13,22
2920  .BYTE 2,32,193,213,212,207,160,211,197,204,19
7
2930  .BYTE 195,212,173,193,173,198,201,204,197,32,
22
2940  .BYTE 2,14,14,14,14,14,14,14,14,14,14
2950  .BYTE 14,14,14,14,14,14,14,14,14,14,22
2960 BOTTOM .BYTE 160,227,232,239,239,243,229,16
0,225,160,230
2970  .BYTE 233,236,229,160,166,160,240,242,229,24
3,243
2980  .BYTE 160,225,160,236,229,244,244,229,242,16
0
2990 NOFILE .BYTE "NO ",34,"OBJ",34," FILES O
N THIS DISK"
3000 KEYS .BYTE 63,21,18,58,42,56,61,57,13,1,5,0,37
3010  .BYTE 35,8,10,47,40,62,45,11,16,46,22,43,23
3020 DISK .BYTE "D:*.*"
3030 FILE .BYTE "D:          "
3040 EXT .BYTE ".OBJ"
```



THE CHIP

The CHIP is a modification designed for your Atari® 810 Disk Drive. It gives your 810 these extended capabilities:

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- Read/Write multiple sectors with the same sector number
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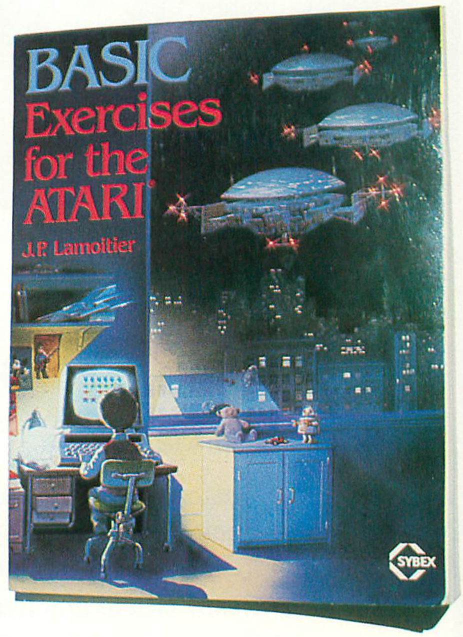
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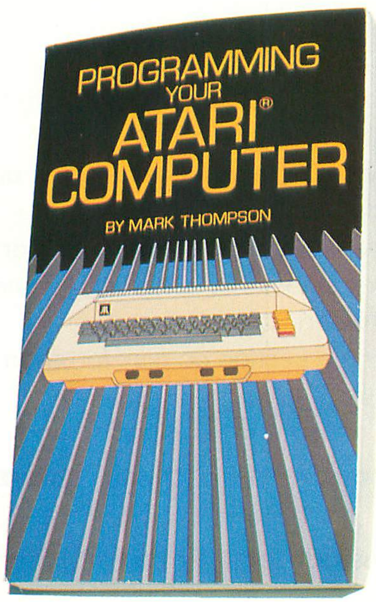
ANTIC PIX BOOKS

BASIC Exercises for the ATARI
by L. P. Lamoitier



Designed for readers with a minimum of scientific or technical background, this book teaches BASIC through a series of graduated exercises. The first chapter presents — what else? — an income tax program. Other chapters cover flowcharts, math with integers, elementary geometry, and data processing. Advanced chapters include games, operations research, and statistics. Each exercise includes a statement and analysis of the problem, solution with flowchart and comments, corresponding program, and sample run. Pains have been taken to adopt a top-down, highly structured approach to solving programming problems. Sybex, $12.95.

Programming Your ATARI Computer
by Mark Thompson



This book, unlike most, starts with a fairly extensive introduction to computer science as a foundation for learning about the ATARI. Number systems, microcomputer architecture and operation, binary arithmetic, and Boolean operations are all covered in introductory chapters. In addition, the book goes into various aspects of ATARI BASIC, including graphics, sound and other applications, with sample programs. One chapter offers a brief introduction to machine language programing. TAB BOOKS Inc., $10.95.

Mapping the ATARI

by Ian Chadwick

Mapping the ATARI is *the* memory map to the ATARI 400/800 Operating System. Covering both Revision A and Revision B of the OS, Chadwick exhaustively describes the function and use of practically every important memory location in the computers, while generally eschewing language-specific information. Extensive sections on ATARI's special-purpose chips (ANTIC, POKEY, and GTIA) explain their purposes far better than the Technical User's Notes. Bill Wilkinson's introduction describes how to access memory in seven different languages — a most illuminating exercise. COMPUTE! Books, $14.95.

The Book of ATARI Software 1983

by Jeffrey Stanton, Robert P. Wells, Sandra Rochowansky



Offering over 300 pages of reviews for the ATARI 400/800 computers (plus reviews of some hardware and VCS games), this is a unique and valuable aid to the confused software shopper. Program categories include games & entertainment, business, education, and utility programs. Each program is rated on a scale of A to F by a number of different criteria — depending on the type of program. Writing style is consistently intelligent, clear, and objective. The Book Company, $19.95.

De Re ATARI

by Amy Chen, Chris Crawford, Jim Dunion, Bob Fraser, and Lane Winner

"All about the ATARI" is what this title means, and what the book delivers, even if you are sometimes required to translate not only the title, but the obscure presentation. This book is valuable because it is a distillation of the ATARI technical manuals by those who knew the most about them. *De Re* is like an adventure game, if you get stuck you just have to keep trying until you figure out what they meant to say. Nowadays it's not too hard to find someone who can ease the journey. If *De Re* ATARI is too easy for you, you're ready for the Technical User Notes, available from Atari, Inc. *De Re* Atari Program Exchange, $19.95.

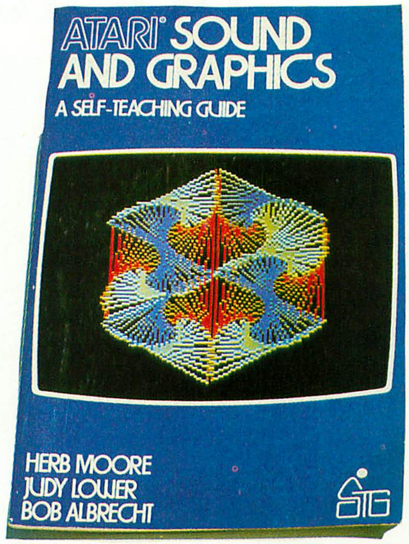
I Speak BASIC to My ATARI

by Aubrey B. Jones, Jr.

An outgrowth of Philadelphia's PRIME project, in which minority students are introduced to careers in engineering, this book is intended for classroom instructional use. However, there is no reason why the book could not be used at home to full advantage by a motivated beginning-level ATARI owner. There are two versions; a teacher's guide and the student's text. Material of a largely introductory nature is presented in bold lettering, in sizes ranging from medium to large. Also, there is a good deal of blank space on many pages. The book includes short programs, trial runs, and illustrations. Hayden Book Co., $15.95.

ATARI Sound and Graphics

by Herb Moore, Judy Lower, and Bob Albrecht



This book picks up where ATARI BASIC left off. The book that came with your BASIC cartridge was fine for learning programming from ground zero, but did not cover ATARI's special features. ATARI Sound and Graphics, however, assumes no prior programming experience. As with ATARI BASIC, the material is presented in self-instructional format. Each short section presents you with a new idea for using BASIC to create an image or sound, then tests you. Once you've covered the fundamentals in earlier chapters, you can learn how to use sound together with graphics, play a little music, and create some special effects. John Wiley & Sons, Inc. $9.95.

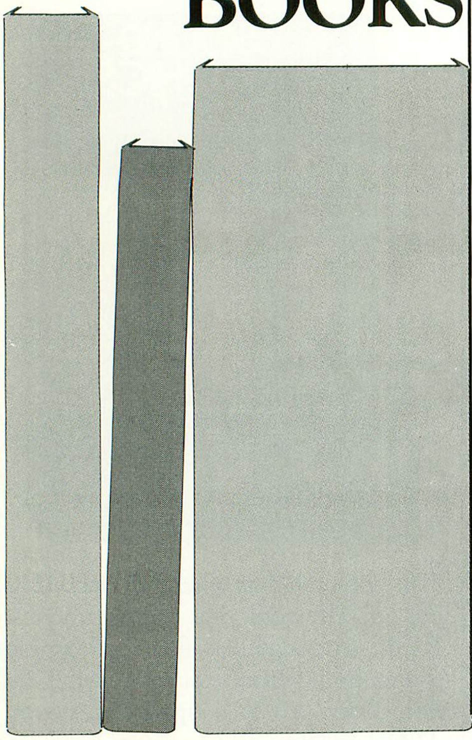
Atari Programming, with 55 Programs

by Linda M. Schreiber

The rank beginner hoping to learn BASIC programming on the ATARI will benefit greatly from the gentle guidance of Linda Schreiber. She starts from zero and progresses smoothly through the powers of BASIC in an organized way. The reader writes programs from the very start, using Schreiber's illustrative examples. She spends extra time on strings and special functions such as PEEKs and POKEs and USR commands. TAB BOOKS, Inc. $14.50.

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ANTIC PIX BOOKS



Kids and the ATARI

by Edward H. Carlson

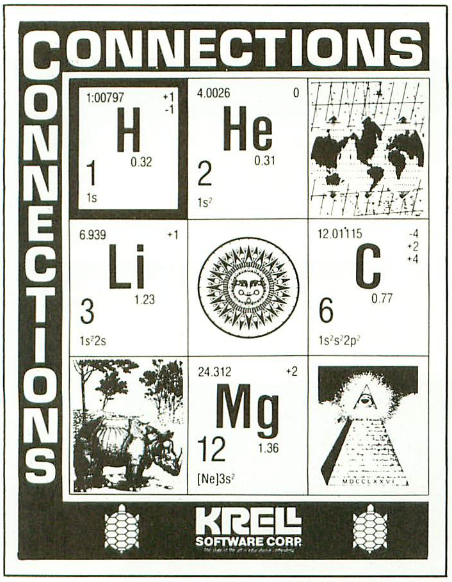
This special primer on programming is for children. Probably a bright seven year old could read and use this book. ATARI operations and elementary programming are cut into the tiniest conceptual units, explained very simply, and illustrated appropriately — usually one concept per page. Attractive and clever, the book is not at all threatening, yet it manages to get into string manipulation, sound and graphics. It includes a glossary of terms explained in simple English. Assignments in each lesson have correct solutions in the back of the book. Adults unfamiliar with computing could profit from this book too. Datamost, $19.95.

Your ATARI Computer

by Lon Poole, with Martin McNiff and Steven Cook

If you buy only one book, buy this. Although most of the information can be found in other places, the collection, presentation, and organization here are superior — not to mention handy. It will not teach you programming, not even BASIC (on which it spends more time than you may wish), but it contains more authoritative information per page than any other publication, except perhaps Atari's own Technical User Notes. This is one of the few books where you can find anything about such important peripherals as printers and disk drives and how these interact with an ATARI. Osborne/McGraw-Hill, $17.95.

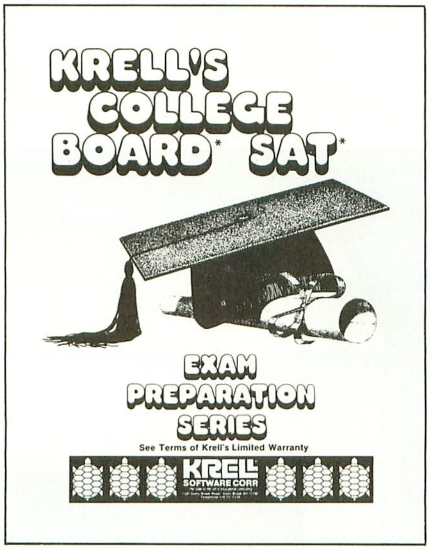
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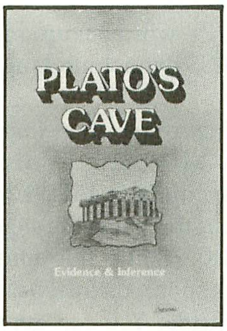
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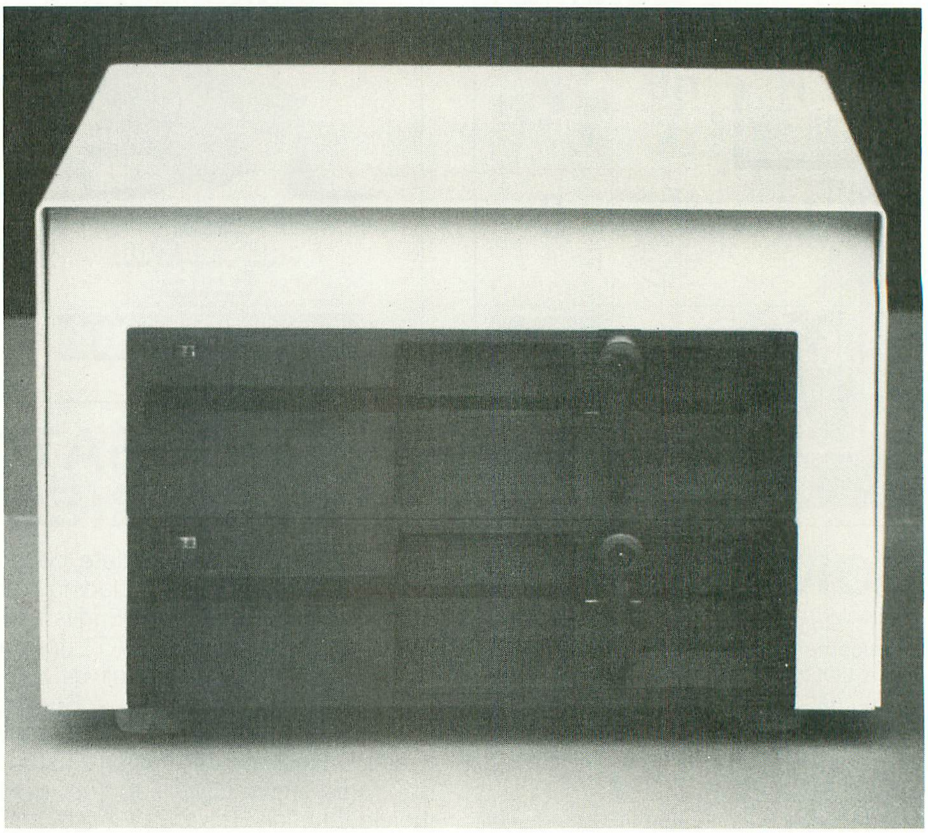
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MICRO MAINFRAME MF-1681 DISK DRIVE

Micro Mainframe
11325 Sunrise Gold Circle, Bldg. A
Rancho Cordova, CA 95670
(916) 635-3997
$549.95 (basic unit)
$249.95 (second drive)

Reviewed by Larry Dziegielewski



The **Micro Mainframe MF-1681** is a single/double density disk drive for the ATARI 400/800/1200. The drive comes ready to run with good documentation, a utility diskette, and is 100% Atari software compatible. The MF-1681 is a single drive unit, but another half-height drive can be added to the same case. The controller in the MMF drive will handle up to eight disk drives.

Features found on the basic unit are:

- single or double density operation
- a printer port for Centronics parallel printers
- a 4K printer spooler
- addition of a second drive for under $300.00
- hard disk firmware included
- any additional ANSI compatible 3", 5¼", or 8" disk drive may be used
- a Z-80 processor with 16K RAM

The addition of a MMF Expansion Box turns the disk drive into a 64K Z-80 which can run CP/M, TRSDOS, MAXI-DOS, and OASIS software. In its basic form, the Z-80 can perform limited functions directly from BASIC. For example, you can read, write, and print disk tracks. The Z-80 also handles ADR (Automatic Density Recognition). This feature allows swapping single and double density diskettes without the use of special software commands. A disk is included in the package which contains the following utilities:

- SETDBL—format a double density disk
- PRTTRK—print any track to screen or printer
- PRTSEC—print any sector to screen or printer
- ADUP—will backup any disk
- DISASS—machine-language disassembler

The first thing that impressed me about the MF-1681 is its size. The unit measures a massive 16½"L × 7½"W × 5"H, about three inches longer than the ATARI 810. While this unit takes up more desk space, the real beauty is what you get inside. You can get two drives in the space normally occupied by one ATARI drive. The MF-1681 uses half-height drive mechanisms supplied by Tokyo Electronic Corporation (TEC). The TEC half-height mechanisms are smooth and quiet, unlike their Atari counterparts. They also seem to run a lot less than the 810's. An 810 will run for seven seconds after a read or write operation, the TEC's only run for 3 seconds. This feature is partly a function of the disk controller.

Support for any product should be of concern to the buyer. Micro Mainframe has been the largest manufacturer of peripherals for the TRS-80 line for over four years. MMF will handle all support and service for the MF-1681 at their factory. Although I have not yet needed service, the staff at MMF answered by questions promptly and in a professional manner.

My MMF drive has performed flawlessly for two months. At $549.95 for the base unit, and $300.00 for an add-on drive, you could have a dual drive, double density system for under $850.00. This is a bargain compared to the PERCOM and ATARI drives. Serious programmers will appreciate the power and flexibility of the Z-80. Micro Mainframe has scored big with this new entry into the Atari field.

FUNDAMENTAL WORD FOCUS

Random House School Division
400 Hahn Road
Westminster, MD 21157
(800) 638-6460 (orders)
$165.00, 48K—diskette

Reviewed by Clark Nobil

Will the new wave of educational software now reaching the market reverse the "rising tide of mediocrity" plaguing the nation's schools? Random House, the publishing giant conspicuously absent from computer bookshelves in recent years, thinks so. This past spring they released an impressive array of microcomputer courseware written especially for schools. Although numerous math-skills programs exist, verbal-skills programs have been slower in development and the few around haven't achieved much notice. Random House may change all that.

Developed for first through ninth graders, **Fundamental Word Focus** is a set of ten programs designed to provide student practice and testing in word analysis skills that stress alphabetical order, syllabication, vowels, prefixes and suffixes, compound words, and other word-recognition skills.

Each program moves along in game-like fashion with extensive use of color graphics and sound to keep action and student involvement at a high pace. Each program also follows a standard format which welcomes the user, offers an explanation of the rules, requests a level of play, and asks for the student's name. After the student has been tested, the score is computed, displayed, then stored for later review by the teacher. What's more, using a secret password, a teacher can access a special menu with a description of each program's objectives, prerequisites, grade levels, word lists, student test scores, and other utilities. Below is a capsule of each program:

- "Alpha Order" (grades 1-6). Three words are displayed in alphabetical order; student must insert fourth word correctly.
- "Square Off" (grades 2-6) hides words in ten-by-ten letter matrix. Student must identify target word within one minute.
- "Double Take" (grades 4-6) presents compound words to be divided correctly by student. Fireworks reward success.
- "Vowel Adventure (grades 1-5). Student identifies letters in words as vowels or consonants. Correct answer advances player one step through maze.
- "Quick Look" (grades 1-6) shows a series of words, then asks if certain letter clusters were included in the series.
- "Syllable Attack" (grades 4-8) gives the student the first syllable, then presents various endings. If a pair makes a "real" word, student is rewarded for "yes" response.
- "Fixation" (grades 4-9). Student gives "yes" or "no" about words having suffix or prefix, but "no" response is correct too often.
- "Word Mix" (grades 4-8) presents four possible word endings to complete a given beginning, within a 30-second limit.
- "Word Smasher" (grades 4-6). A complete word is presented for the student to divide properly into syllables.
- "Syllable Countdown" (grades 3-6) shows a series of words on screen. Student responds with a number of syllables — quick response gets higher score.

Fundamental Word Focus is not only "user-friendly", it is "teacher-friendly"; all the information necessary for a teacher (or parent) to administer the program to a student is contained in the program itself. What's in the manual, in other words, is also on the screen. The program is so thoughtfully constructed that the manual is almost unnecessary.

What is likely to impress teachers and parents most about these programs, however, is the major commitment this large American publisher has made toward providing high-quality, comprehensive educational courseware for public schools. The latest catalog of educational courseware from Random House reveals the depth of their commitment to this market. In reading skill development, for instance, they offer as many as ten different program-courses. In mathematics, seven are offered. In language arts, six. What's more, Random House has also developed "classroom management" programs for teachers and school administrators to simplify keeping track of student grades, attendance records, etc. And, as though the current catalog of educational offerings weren't enough, Random House will also be introducing 30 more educational programs over the next 18 months.

TECHNICAL ASPECTS OF DATA COMMUNICATION

by John E. McNamara
Digital Press
Educational Services
Digital Equipment Corporation
Bedford, MA 01730
330 pages
$33.50

Electronic hobbyists and electrical engineer-designers will find this book useful. It is a highly detailed and technical guide to the design and maintenance of data-communications systems. If you're interested in learning how to build, buy, troubleshoot, or repair a system, or you just want to know more technical aspects of how your telephone or modem works, this manual is for you. The author is an electrical engineer from M.I.T. who has worked for Digital Equipment Corporation since 1968.

KRELL'S COLLEGE BOARD

Krell Software Corporation
1320 Stonybrook Road
Stonybrook, NY 11790
(516) 751-5139
$299.95, 48K—diskettes (10)

Reviewed by Dave Mentley

The College Board Scholastic Aptitude Test traditionally has been a paper and pencil testing procedure, adapted for a multiple choice (or guess) format and scored by computing machinery to process the hundreds of thousands of high school students who go through the system. Now you can use your personal computer to prepare for the test. The Krell program is much more comprehensive and may actually help build your vocabulary, English grammar and math skills.

The Krell Software package was designed with an unusual philosophy. Instead of training for test-taking techniques, the programs are designed to improve fundamental mastery of verbal and math skills. The package is not meant to be the equivalent of a high school education on disk, but rather, a very narrow but strong concentration on SAT-type material. There are two disks included in the package covering six areas:

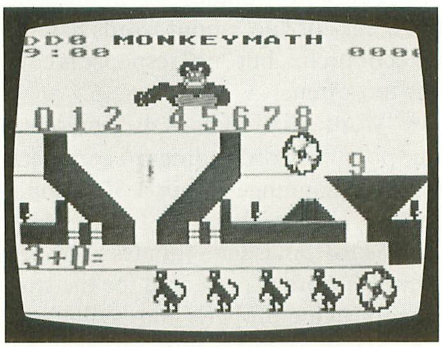
1. Reading Comprehension
2. Sentence completion
3. Vocabulary (2 disks)
4. Word relationships
5. Math (3 disks)
6. Test of standard written English (3 disks)

All materials except for a few line drawings and some sample reading passages are on the disks. The Vocabulary sections contain a very broad range of words, many of which will be seen in a real SAT. The Test of Standard Written English is very well prepared and explanations are provided for all answers after each choice. These English problems are very tricky, yet useful, even for computerists who are beyond high school. Almost anyone could learn better grammar from this course.

The math problems are actually formula-driven so that many problems of the same type (but with different answers) can be tried. Up to 1000 problems can be generated. Again, unique explanations of the answers are provided to each problem. It is clear that much careful thought by several competent educators went into this package. The software works very quickly with the ATARI computer. The publisher has a lot of faith in the efficiency of the program as evidenced by the money-back guarantee. You can get a refund if your score is not raised by at least 75 points after using this course.

Other software companies also offer programs that help develop academic skills. Program Design, Inc. markets a package called Preparing for the SAT. To develop and improve verbal abilities you would use The Vocabulary Builder and Analogies sections and to increase your numerical competency you would use The Number Series and Quantitative Comparisons sections. CBS Software and Harcourt Brace Jovanovich, major communications/publishing companies, plan to market ATARI versions of their exam prep programs soon.

Do you really need a computer program to prepare for the SAT, or will a $10 paperback book suffice? This is a difficult question. On one hand, the Krell package will present the problems to you actively and interact with you when you answer. On the other hand, the test is pencil-and-paper based, and training from a book is more realistic. Ultimately, the question will be answered by your budget.



MONKEY MATH

Artworx
150 N. Main St.
Fairport, NY 14450
(800) 828-6573
(716) 425-2833
$19.95, 16K—cassette
$23.95, 24K—diskette

Reviewed by David Plotkin

Monkey Math, by Dennis Zander, has to be one of the most entrancing educational games ever written. The purpose of this colorful and carefully crafted program is to teach arithmetic. With its multiple skill levels and amusing sound and graphics, children (and adults) could spend hours learning and sharpening skills without even realizing it.

The premise of the game is simple. The player controls a huge gorilla (I've nicknamed him "Art") with a joystick plugged into Port One. The gorilla can move back and forth above a hopper. A conveyor belt containing numbers passes below the gorilla, and pressing the fire button on the joystick causes the gorilla's fist to slam down and knock a number into the hopper. Below the hopper is another conveyor belt containing an uncompleted arithmetic equation.

The object is to knock the correct number into the hopper to complete the equation. If you do, a team of monkeys rolls away the completed equation, and a new equation takes its place. Knocking the wrong number into the hopper causes the team of monkeys to remove the wrong answer and you get to try again. Each time you complete an equation correctly, your score increases. A clock on the wall behind "Art" shows that that game starts at 8:00 a.m. and ends at 4:00 p.m. — quitting time, when the whistle blows.

The goal in Monkey Math is to complete as many equations correctly as possible in the limited time. While giving the wrong answer doesn't detract from your current score, it does waste time and hampers your efforts to get a high score. Fast reflexes are also rewarded. Once you've solved the equation in your head, it is advantageous to hit the correct number into the hopper the first time it appears on the conveyor belt, otherwise you'll have to wait till it comes around again.

Monkey Math offers several options such as counting, addition, subtraction, and division. The varying skill levels not only control the speed at which numbers pass by under "Art", but also the difficulty of the problems. To further increase difficulty, you are often given the answer, and you must supply one of the elements (i.e., the multiplicand or divisor) of the equation. While very young children can play the counting game, the full-speed division should be challenging to anyone.

Monkey Math is very well done and should prove to be an engaging and effective teaching tool. Such amusing and attractive touches as the gorilla gobbling bananas during his lunch break and the excellent use of color and sound should make this game popular with your family or school mates. I recommend you get a copy and see if Monkey Math can make a monkey out of you!

ELEMENTARY BIOLOGY

Atari Program Exchange (APX)
P.O. Box 3705
Santa Clara, CA 95055
(408) 727-5603
(800) 672-1850 (within California)
(800) 538-1862 (outside California)
$29.95, 16K—diskette

Reviewed by Karl Wiegers

Elementary Biology is a product of the Minnesota Educational Computing Consortium (marketed by APX) which has written a variety of educational programs for ATARI computers. This diskette contains three lessons, directed at students from ages nine to 14 (grades 2-9). The first lesson is an elementary tutorial on the circulatory system ("Circulation"), while the other two are role-playing simulations of the ecology of a lake ("Odell Lake") and the surrounding land areas ("Odell Woods").

This program comes with a diskette and a 60-page "support booklet". This booklet provides some illustrations of sample screen displays, but its main purpose is to help a teacher use the programs effectively in conjunction with other classroom activities. There are worksheets for students to complete as they go through the lessons and quizzes, and suggestions for additional teaching activities to complement the computer lessons.

"Circulation" uses tutorial, quiz, and animation to describe the functioning of a two-chambered heart in a fish. Low-resolution color graphics are used to depict parts of the fish. In an effective demonstration, the student watches a blue blood cell leave the heart ventricle, turn red as it picks up oxygen in the gills, turn blue as it passes through some other part of the fish, and finally return to the auricle of the heart. Simple questions interrupt this process in the quiz segment. No help is provided for the questions asked, but if any are answered incorrectly the student is advised to redo the tutorial part of the lesson. "Circulation" is an easy but effective lesson, and would nicely complement a discussion of the circulatory system.

"Odell Lake" teaches the student about food chain relationships in the lake by a process of simulation. The student plays the role of one of six kinds of fish in the lake. While playing this role, the student encounters other fish and animals and must decide what to do in each encounter: ignore it, eat it, chase it, or escape. From the outcome of each encounter, the student must deduce the prey/predator relationships of all the fish in the lake.

This lesson is fun, informative and it uses excellent graphics and animation to illustrate each action. The student actively participates in the learning process by role-playing and keeping experimental journals.

Role-playing is also a central feature of "Odell Woods", where the student can opt to be a mouse, rabbit, fox, or wolf. Again, he must decide what to do in a series of random encounters with other components of the ecosystem. The support booklet describes the model used for the simulation and gives the outcomes of each possible encounter. This exercise involves no visual displays, but again actively involves the student in the lesson. Thoughtful and positive feedback is given after each decision.

All three of these lessons are informative and entertaining. They exhibit fairly good applications of ATARI graphics, although sound effects would have been a nice added touch. Students of all ages would enjoy the "Odell Lake" and "Odell Woods" simulations, although "Circulation" is fairly rudimentary and does not really fit with the other lessons. I recommend Elementary Biology for classroom use with the target age group.

THE BANK STREET WRITER

Broderbund Software
1938 Fourth St.
San Rafael, CA 94901
(415) 456-6424
$69.96, 48K—diskette

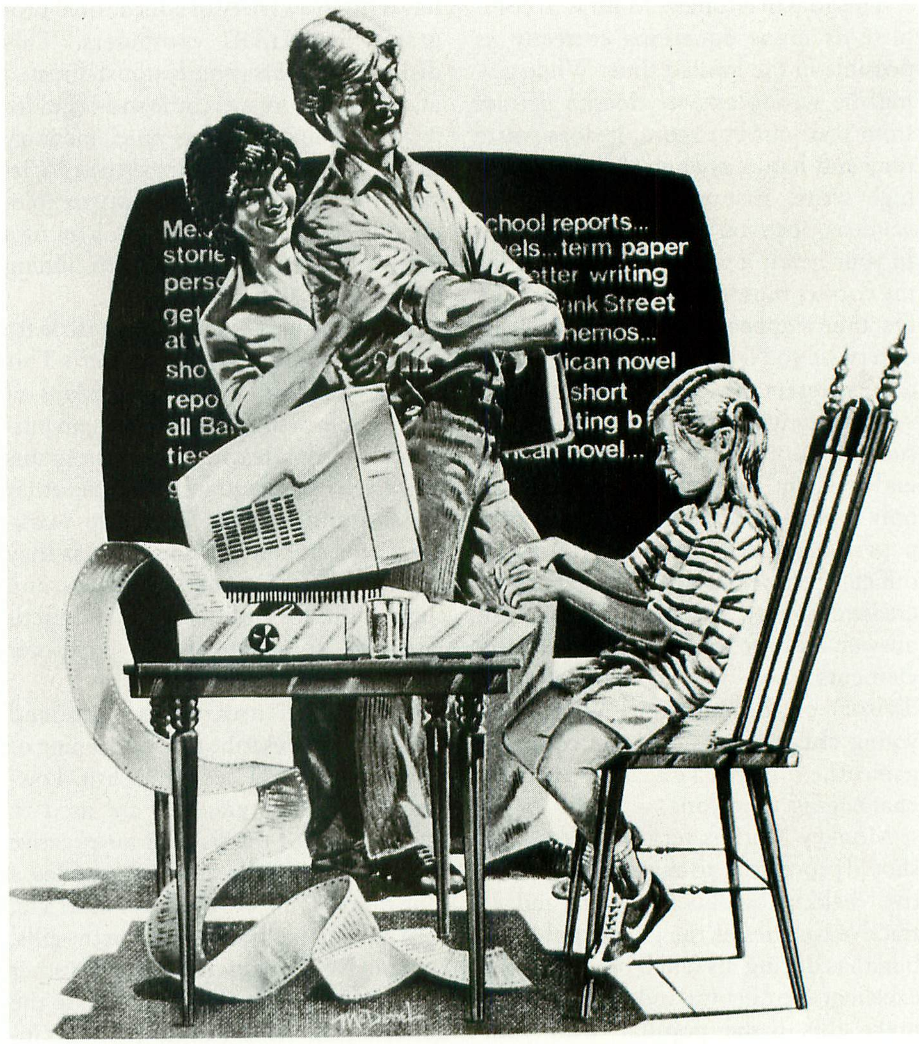
Reviewed by Steve Oliver II

The Bank Street Writer is an incredible value for the price. While it doesn't display 80 columns on the screen, it has many easy-to-use features. In fact, it was designed and developed by Intentional Educations, Inc., The Bank Street College of Education, and Franklin E. Smith, and underwent much testing by students. It was designed for, and succeeds in serving, the entire family. Its prompts, menus, structure, and excellent manual make it simple to learn. Even if you are a beginner with the ATARI you could easily use the Writer the first time you sat down to use it.

Upon loading, you have a choice of three programs to use: the Writer itself, the Tutorial (by inserting the other side of the disk), or the Utility program (by pressing [ESC] while the Writer loads). The Tutorial interactively teaches you the major features of the Writer. It consists of five short lessons. The Utility allows you to change certain parameters of the Writer: which disk drive for data storage, margins and headers on the printed documents, and listing of files and their passwords. I have not yet found it necessary to use the Utility. The Writer's default values seem to be just fine.

The Writer is divided into three modes: Write, Edit, and Transfer. You start off in the Write mode, and to get to the Edit mode you press [ESC]. To return to Write, press [ESC] again. You get into Transfer through the Edit mode.

At all times, prompts are displayed at the top of the screen to let you know your available choices. But if you should get lost or confused, you just press [ESC] to return to the Write mode.



This is a really good first *word processor — for someone new to the ATARI.*

WRITE MODE

The Write mode has few options: [ESC] to the Edit menu, use the [CTRL] keys to erase or enter text. The computer functions as a regular typewriter keyboard to allow you to type your letter, report, or story, except for certain keys like inverse video, the control characters, [TAB], and [BREAK]. You simply type as usual, and when a word reaches the right edge of the screen it wraps around to the next line, eliminating the need for carriage returns.

To indent a paragraph, you press [CTRL]I. [CTRL]C centers a line of text on the printed document, and [CTRL]S tells you how much memory space you have left. To use the tutorial, you must have the BASIC cartridge installed. With the cartridge in, you have room for less than 1000 words, but without it you can fit in more than 2300 words.

EDIT MODE

The cursor controls available in this mode are: the arrows keys, [B], [E], [U], and [D]. These move the cursor in all four directions, to the beginning and end

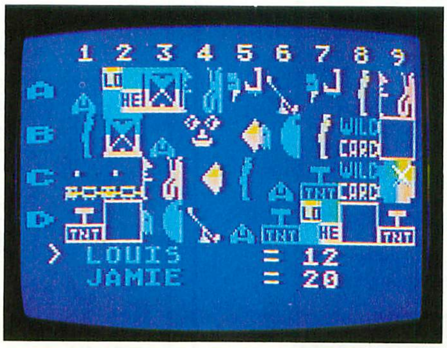
of the document, and up or down twelve lines. Your major editing features are: Erase, Unerase, Move/Moveback, Find/Replace, and Transfer Menu. These allow you to erase (or unerase if you change your mind), move, and find or replace words. Insertions and deletions are easy, too. Simply enter Edit mode, position the cursor, return to Write and type. The new text pushes aside the old. All these features are easy to use and prompted.

TRANSFER MODE

This mode allows you to save or retrieve a file, initialize (format) a disk, delete or rename a file, print a document, quit, or clear a document from memory. The only option here that really needs elaboration is printing. You can print a draft or a final copy. Draft copies are printed exactly as they appear on the screen — 38 columns, but also double-spaced. This is very useful for proofreading. The Print-Final option allows you to choose the number of characters per line you want, spacing between lines, connect files, page numbering (top, bottom, or not at all), pausing between pages, headings and choosing certain parts of the file to print. It also lets you see where each page ends and starts, allowing you to change the page breakdown if you desire. It really prints out nice copy.

I found very few shortcomings in the Writer. One of them, however, is the fact that it only displays eighteen 38-column lines on the screen. While it can print up to 126 characters per line on paper, it's nice to be able to see them all on the screen. But a Broderbund spokesperson told me that an 80-column display would have slowed down the program too much. As it is now, it sometimes has a slight delay problem when working with large amounts of text. This is not a word procesor for people who do a *lot* of writing, because it just isn't made for those tasks.

The Bank Street Writer was designed for use at home by the family, and for those whose writing needs are on a small scale. This is a really good *first* word processor — for someone new to the ATARI.



MATCHBOXES

Broderbund Software
1938 Fourth St.
San Rafael, CA 94901
(415) 456-6424
$29.95, 32K—diskette

Reviewed by David Duberman

Matchboxes is an ingenious computerized version of the classic game of Concentration — and more. One or two can play, but it's easy to imagine the whole family getting involved in any of the seven two-player variations.

When the game begins, you're presented with a rectangular grid of 36 blank numbered boxes. Concealed behind each box is a cleverly animated figure accompanied by a fragment of a familiar tune, for which there is one identical match somewhere in the grid. Players use joysticks and fire buttons to uncover two boxes at a time, trying to match the identical pairs. When one of you makes a successful match, the animated figures briefly vanish to reveal parts of a giant-sized word concealed behind the grid.

At this point, if you press the fire button, you may type in your guess as to the word's identity. Whether or not you choose to guess the word, you may then try to match another pair. The word may be chosen by a human or by the computer, and it may be frontwards, scrambled, or reversed, at your option. As more successful matches are made, more of the word is uncovered. If no one guesses the word before all matches are made, the winner is the person with the most matches. You may, if you choose, play a simpler form of the game that omits the concealed word. In this version, the object is to get the most matches.

You may also play any of these versions of the game against the computer. There are three levels of difficulty in the single-player mode. Of course, since the computer has a vastly superior memory to our puny organic cells, it tends to run away with the game. It actually does guess the word wrong the first few tries, but since it chose the word in the first place, it usually comes up with the correct answer in a short while. This game really requires more than one human player for full enjoyment, though playing alone with the computer can be fun.

Matchboxes represents a delightful departure by Broderbund from their norm of shoot-em-up arcade thrillers. There are three sets of animated characters, with a new set loaded from disk or cassette at the start of each new game, and all are quite well done. These include blasting rockets, bouncing kangaroos, a Pac-man scenario (accompanied by Comin' Through the Rye), and an assortment of colorful animated abstract designs. Tunes include Pop Goes the Weasel, Old MacDonald, and My Country 'Tis of Thee. The game is ideal for families with young children learning to read, but is fun for all ages to play.

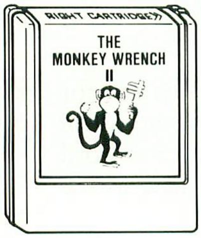
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The MONKEY WRENCH provides 18 direct mode commands. They are: AUTO LINE NUMBERING — Provides new line numbers when entering BASIC program lines. RENUMBER — Renumbers BASIC's line numbers including internal references. DELETE LINE NUMBERS — Removes a range BASIC line numbers. VARIABLES — Display all BASIC variables and their current value. Scrolling — Use the START & SELECT keys to display BASIC lines automatically. Scroll up or down BASIC program. FIND STRING — Find every occurrence of a string, XCHANGE STRING — Find every occurrence of a string and replace it with another string. MOVE LINES — Move lines from one part of program to another part of program. COPY LINES — Copy lines from one part of program to another part of program. FORMATTED LIST — Print BASIC program in special line format and automatic page numbering. DISK DIRECTORY — Display Disk Directory. CHANGE MARGINS — Provides the capability to easily change the screen margins. MEMORY TEST — Provides the capability to test RAM memory. CURSOR EXCHANGE — Allows usage of the cursor keys without holding down the CTRL key. UPPER CASE LOCK — Keeps the computer in the upper case character set. HEX CONVERSION — Converts a hexadecimal number to a decimal number. DECIMAL CONVERSION — Converts a decimal number to a hexadecimal number. MONITOR — Enter the machine language monitor.

In addition to the BASIC commands, the Monkey Wrench also contains a machine language monitor with 16 commands used to interact with the powerful features of the 6502 microprocessor.

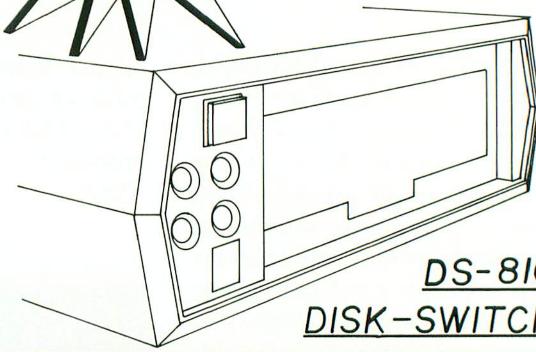
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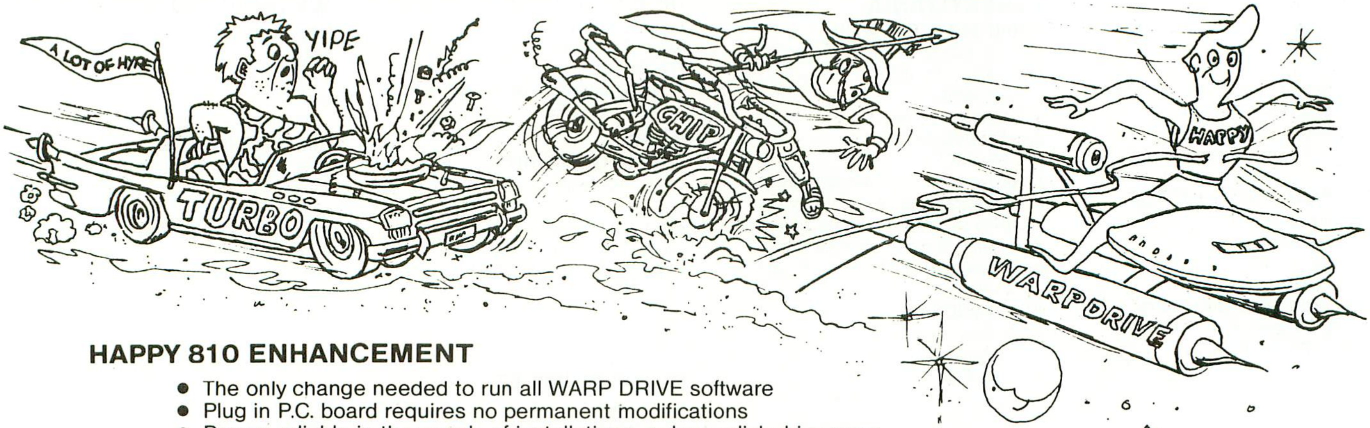
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PLAYER/MISSILE TUTORIAL *continued from page 19*

Line 3130 simply decrements the P0Y variable so that the next vertical motion will take the new vertical position into acocunt when it uses the expression in line 3110.

Armed with this knowledge, we write the subroutine for downward motion as follows:

```
3200  FOR L=9 TO 0 STEP-1
3210  POKE PMMEM+512+P0Y+L,PEEK
      (PMMEM+511+P0Y+L)
3220  NEXT L
3230  P0Y=P0Y+1
3240  RETURN
```

In line 3200, the loop is reversed using the decremental STEP–1 clause. The 512 and 511 have been transposed in line 3210 so that the value in the lower address is copied to the higher address. Try to visualize how the routine would fail if line 3200 read the same as line 3100. This would cause the first byte, the zero we added, to be copied over the entire player, thus erasing it completely.

If you have a cassette recorder or disk drive, SAVE your program. Now RUN it again, and move the cube around the screen with a joystick plugged into Port One. Since the program does not TRAP errors or set margins for players, moving your player too far to either side will cause an ERROR #3 (VALUE ERROR) because the P0X variable will become greater than 255 or less than 0. Only numbers in the range of 0 to 255 can be POKEd into RAM addresses or registers. If you move the player too far off the screen up or down, your player will cruise through RAM and may temporarily destroy parts of the Operating System, causing your system to "crash". This causes no damage to the computer, but you might have to shut it off and power-up again if the computer "locks up". So be careful.

These are the fundamentals of Player/Missile graphics. Experimentation will further enhance your ability to use this powerful feature of the ATARI computer.

```
1 REM ** PM DEMO ** ANTIC MAGAZINE **
1ØØØ WIDTH=Ø
11ØØ A=PEEK(1Ø6):A=A-4:POKE 1Ø6,A
12ØØ GRAPHICS Ø:POKE 752,1:? CHR$(125)
13ØØ SETCOLOR 2,Ø,Ø
14ØØ POKE 7Ø4,54
15ØØ POKE 53256,WIDTH
16ØØ POKE 54279,A
17ØØ PMMEM=A*256
18ØØ PØX=128:PØY=64
19ØØ FOR L=PMMEM TO PMMEM+1Ø23:POKE L,
Ø:NEXT L
2ØØØ DATA 31,35,69,249,137,138,14Ø,248
21ØØ FOR L=PMMEM+512+PØY TO PMMEM+512+
PØY+7:READ BYTE:POKE L,BYTE:NEXT L
22ØØ POKE 559,46
23ØØ POKE 53277,3
24ØØ POKE 53248,PØX
25ØØ J=STICK(Ø)
26ØØ IF J=7 THEN PØX=PØX+1:POKE 53248,
PØX
27ØØ IF J=11 THEN PØX=PØX-1:POKE 53248
,PØX
28ØØ IF J=14 THEN GOSUB 31ØØ
29ØØ IF J=13 THEN GOSUB 32ØØ
3ØØØ GOTO 25ØØ
31ØØ FOR L=Ø TO 9
311Ø POKE PMMEM+511+PØY+L,PEEK(PMMEM+5
12+PØY+L)
312Ø NEXT L
313Ø PØY=PØY-1
314Ø RETURN
32ØØ FOR L=9 TO Ø STEP -1
321Ø POKE PMMEM+512+PØY+L,PEEK(PMMEM+5
11+PØY+L)
322Ø NEXT L
323Ø PØY=PØY+1
324Ø RETURN
9999 END
```

Table 1

Offset Values from PMMEM

	Single-Line Resolution	Double-Line Res.
Unused Area*	+000 → +767	+000 → +383
Missiles	+768 → +1023	+384 → +511
Player Zero	+1024 → +1279	+512 → +639
Player Two	+1280 → +1535	+640 → +767
Player Three	+1536 → +1791	+768 → +895
Player Four	+1792 → +2047	+896 → +1023

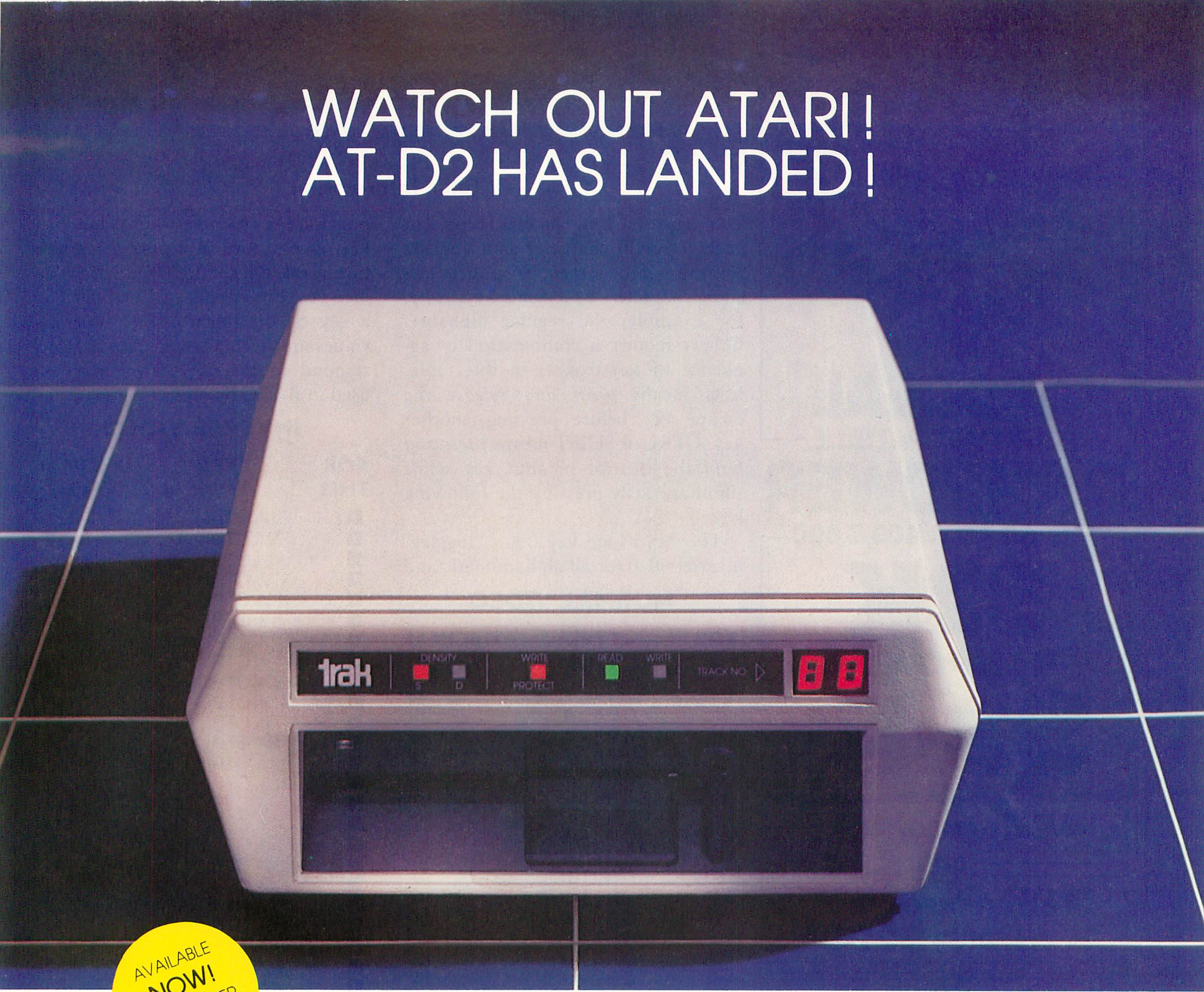
*This area is not used by P/M graphics, so it may contain anything desired. It will be protected in the same way as the other reserved memory for P/M.

Table 2

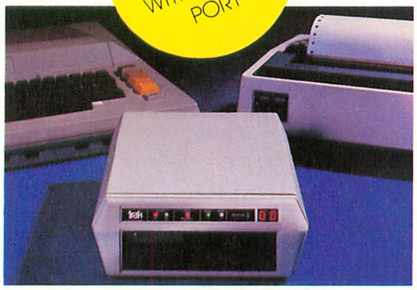
Memory Locations for P/M Graphics

Memory Address	Function
106	Contains the number of pages of free RAM in the computer.
704-707	Color registers for players 0-3.
53256-53259	(H) Width registers for players 0-3.
54279	(H) Page number of the start of the reserved area of memory.
559	POKE with 62 for single- or 46 for double-line resolution.
53277	(H) POKE with 3 to activate P/M graphics.
53248-53251	(H) Horizontal position registers for players 0-3.
623	Controls priorities of players and playfields.

An "(H)" before a function description indicates that the location is a hardware register.



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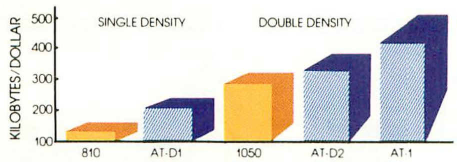
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LISTING CONVENTIONS

Table Information

Our custom font listings represent each ATASCII character as it appears on the video screen. You generate some characters by a single keystroke, for example, the regular alphabet. Others require a combination or sequence of keystrokes. In this table, ESC means *press and release* the escape key before pressing another key. CTRL or SHIFT means *press and hold* the control or shift key while simultaneously pressing the following key.

The Atari logo key (⅄) "toggles" inverse video for all alphanumeric and punctuation characters. Press the logo key once to turn it on; press again to turn it off. On the 1200XL there is no logo key; inverse video is controlled by a key on the function row. Decimal values are given as reference, and correspond to the CHR$ values often used in BASIC listings.

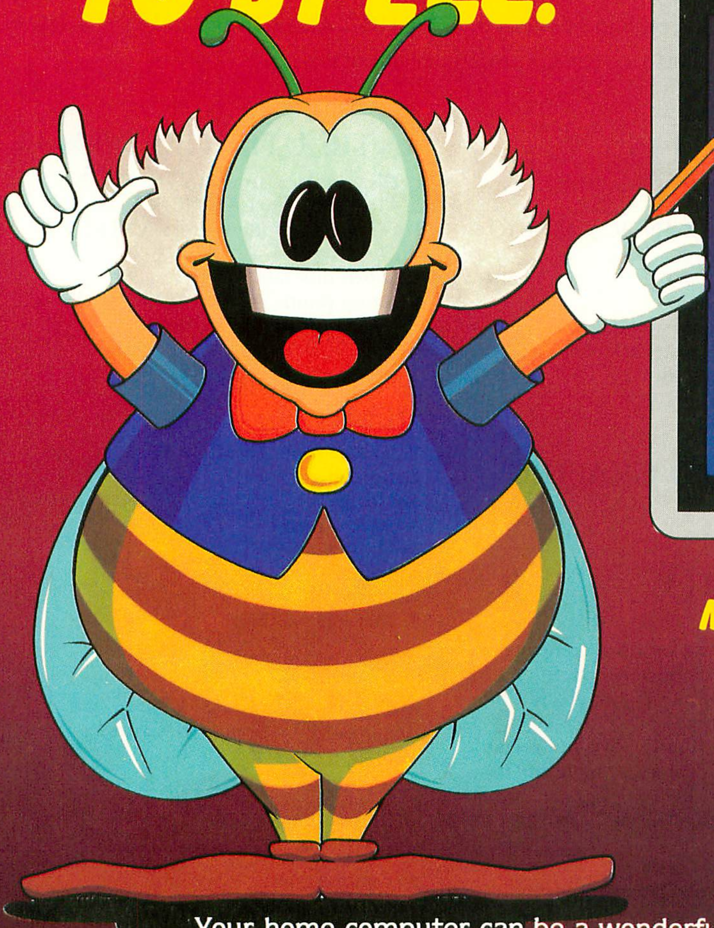
NORMAL VIDEO

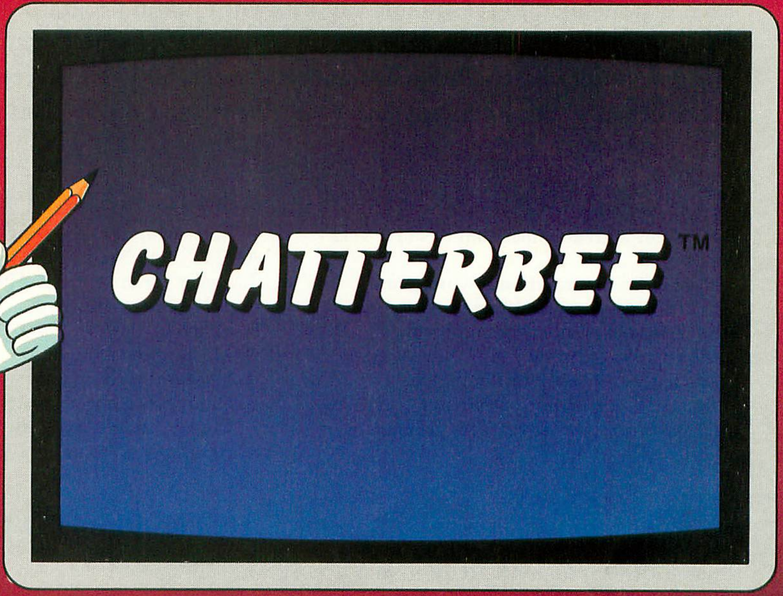
FOR THIS	TYPE THIS	DECIMAL VALUE
	CTRL ,	0
	CTRL A	1
	CTRL B	2
	CTRL C	3
	CTRL D	4
	CTRL E	5
	CTRL F	6
	CTRL G	7
	CTRL H	8
	CTRL I	9
	CTRL J	10
	CTRL K	11
	CTRL L	12
	CTRL M	13
	CTRL N	14
	CTRL O	15
	CTRL P	16
	CTRL Q	17
	CTRL R	18
	CTRL S	19
	CTRL T	20
	CTRL U	21
	CTRL V	22
	CTRL W	23
	CTRL X	24
	CTRL Y	25
	CTRL Z	26
	ESC ESC	27
	ESC CTRL −	28
	ESC CTRL =	29
	ESC CTRL +	30
	ESC CTRL *	31
	CTRL .	96
	CTRL ;	123
	SHIFT =	124
	ESC SHIFT CLEAR	125
	ESC DELETE	126
	ESC TAB	127

INVERSE VIDEO

FOR THIS	TYPE THIS	DECIMAL VALUE
	⅄CTRL ,	128
	⅄CTRL A	129
	⅄CTRL B	130
	⅄CTRL C	131
	⅄CTRL D	132
	⅄CTRL E	133
	⅄CTRL F	134
	⅄CTRL G	135
	⅄CTRL H	136
	⅄CTRL I	137
	⅄CTRL J	138
	⅄CTRL K	139
	⅄CTRL L	140
	⅄CTRL M	141
	⅄CTRL N	142
	⅄CTRL O	143
	⅄CTRL P	144
	⅄CTRL Q	145
	⅄CTRL R	146
	⅄CTRL S	147
	⅄CTRL T	148
	⅄CTRL U	149
	⅄CTRL V	150
	⅄CTRL W	151
	⅄CTRL X	152
	⅄CTRL Y	153
	⅄CTRL Z	154
	ESC SHIFT DELETE	156
	ESC SHIFT INSERT	157
	ESC CTRL TAB	158
	ESC SHIFT TAB	159
	⅄CTRL .	224
	⅄CTRL ;	251
	⅄SHIFT =	252
	ESC CTRL 2	253
	ESC CTRL DELETE	254
	ESC CTRL INSERT	255

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ANTIC GAMES #5

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2. Steller Defense: from ANTIC V.1, No.6, slightly improved.
3. Yahtzee
4. Mastermind
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6. Slalom: become a master schusser
7. Couch: analyze yourself
8. Aceyducy & more

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Digitized Photos

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1. Doc: program allows you to accompany programs with separate documentation on disk
2. Microassembler: allows you to create USR routines-assembler, more
3. Assembler-Editor: BASIC, slow but versatile
4. Num: automatic line numbering utility in BASIC
5. Memtest: runs without BASIC cartridge, to test all memory
6. Color: 128 colors at once
7. Printnop: connect parallel printer from jacks 3 & 4

ANTIC UTILITIES DISK #2

1. Bubble Sort: from ANTIC V.1, No.4
2. Typo: from ANTIC V.1, No.3
3. Home inventory
4. KEY 6: Cipher coding
5. Renumber
6. Compare: listings for differences
7. SUPER: menu
8. Modem
9. RT clock & more

ANTIC UTILITIES DISK #3

1. Disassembler: from ANTIC V.2, No.1
2. Tiny Text: from ANTIC V.1, No.6
3. GTIA text window: from ANTIC V.2, No.1
4. Label: disk label on Epson
5. Set up printer: sets up MX80 for Visicalc
6. Keyboard: tutorial & more

ANTIC GRAPHICS DEMO #1

1. Spider: from ANTIC V.1, No.3
2. Rainbow
3. Horses
4. ATARI logo
5. Oxygen
6. Spiral
7. Pretty
8. Message and more

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Requires Music Composer Cartridge

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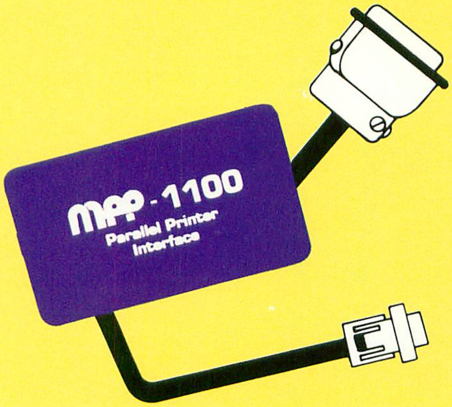
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2. Draw
3. Rainbow
4. Tune Rite
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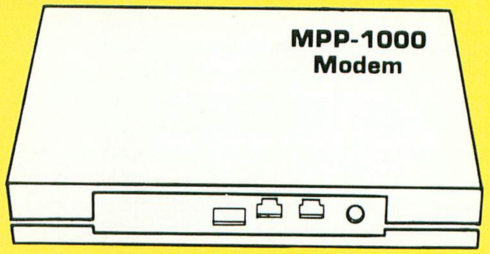


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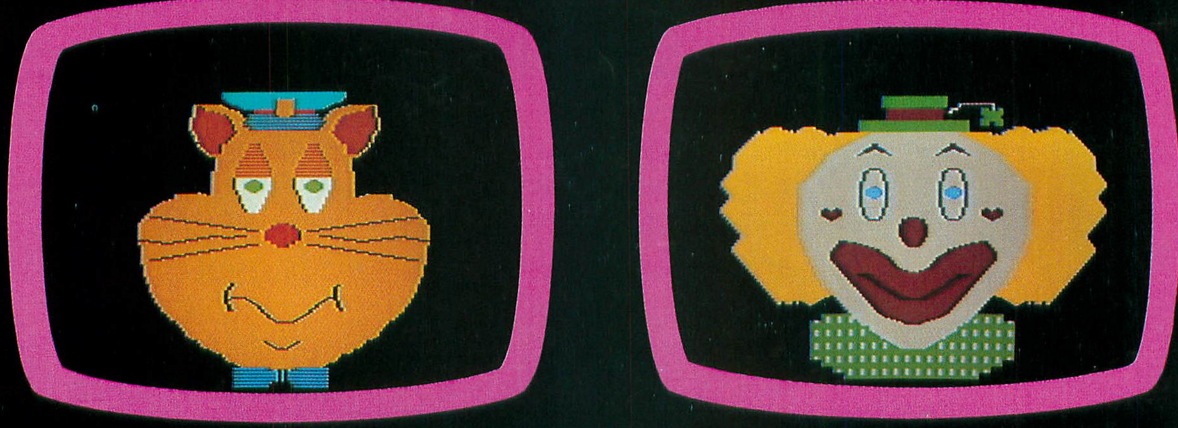
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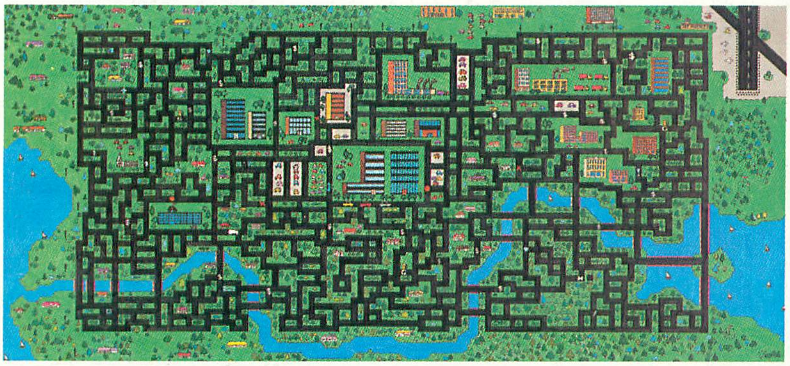
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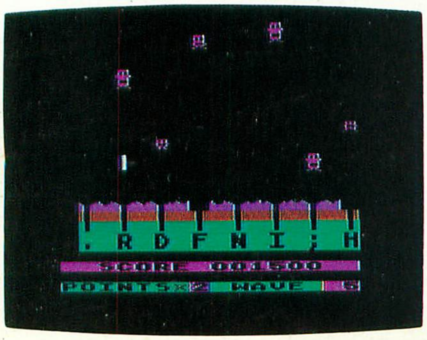
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